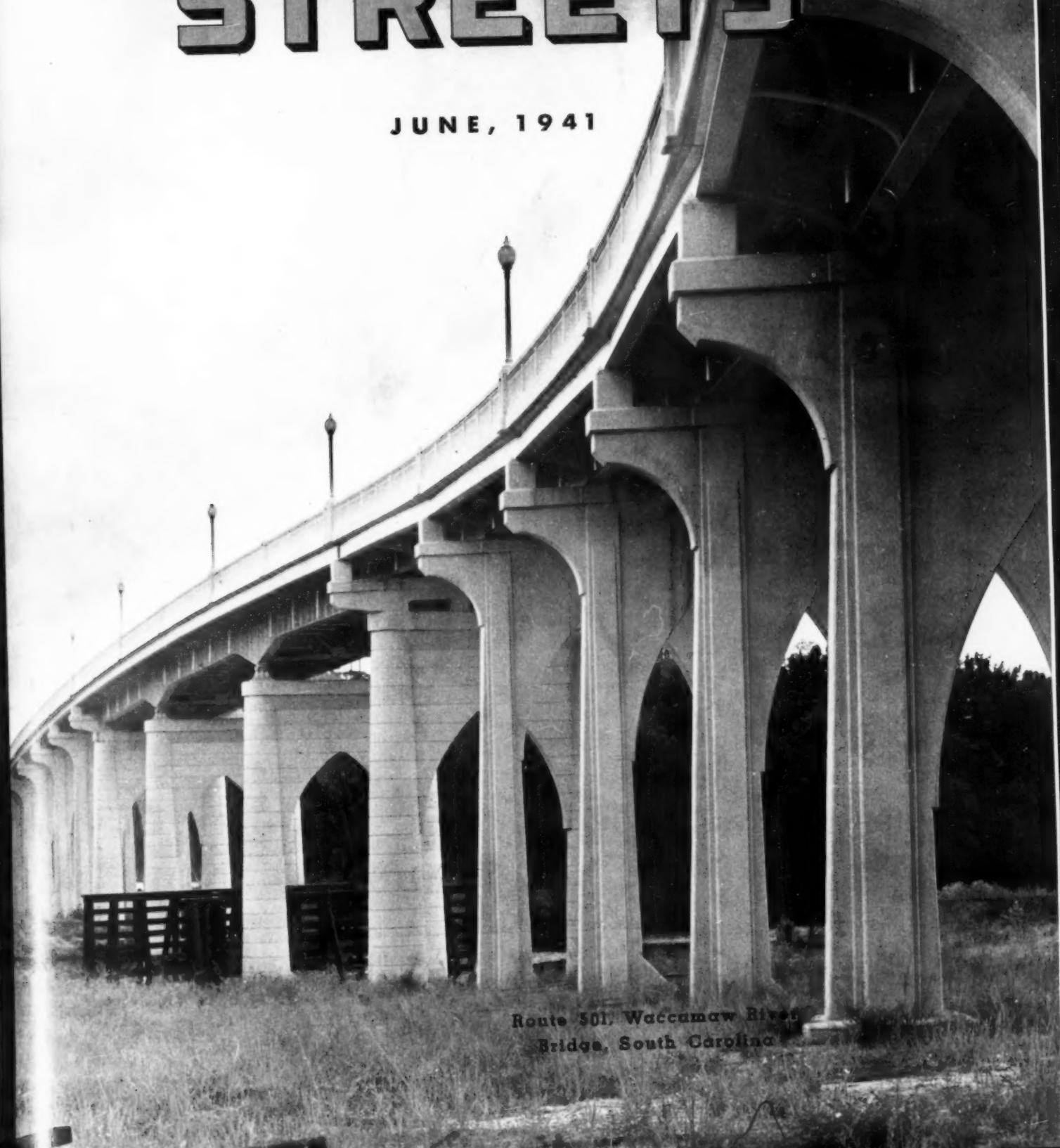


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ROADS AND STREETS

JUNE, 1941



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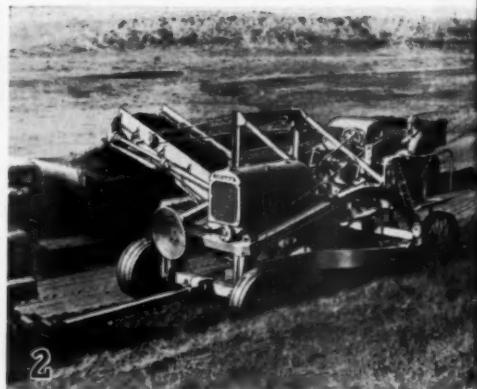
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V. J. BROWN, Publishing Director

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C. T. MURRAY
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ROADS and STREETS

Vol. 84, No. 6

June, 1941

A GILLETTE PUBLICATION
ESTABLISHED 1906

MUCK DREDGED OUT SOLID FILL PUMPED IN

*Road Across Marsh Land Built on Fill
Of Peculiar Design*

By T. E. WILSON

Resident Engineer
South Carolina State
Highway Department

RARELY is the opportunity afforded a highway engineer to build a road that presents as many new and interesting problems as did the recently completed road across the marsh lands of Beaufort County, South Carolina, between St. Helena Island and Hunting Island. Twenty to thirty feet of unstable mucky material had to be dredged out before the road fill could be built to an elevation of eight and one-half feet above the marsh.

In connection with the removal of the unstable material an unusual problem was the removal of the deep muck from around and between the first two bents of Harbor River bridge without causing unbalanced pres-

sure on the piling during removal. This problem proved especially interesting since the space between the bents was not enough to permit the use of the ladder and cutter, head of the dredge. Of equal interest, of course, was the refill of stable material around these bents so as not to unbalance the pressure on the piles.

The two islands are separated by a stream called Harbor River. Several years ago a bridge was built over Harbor River on a proposed highway alignment between the two islands but the highway or causeway part was never completed. The Hunting Island approach was completed but the 1.28-mile St. Helena Island approach was not built. This uncompleted length was entirely over

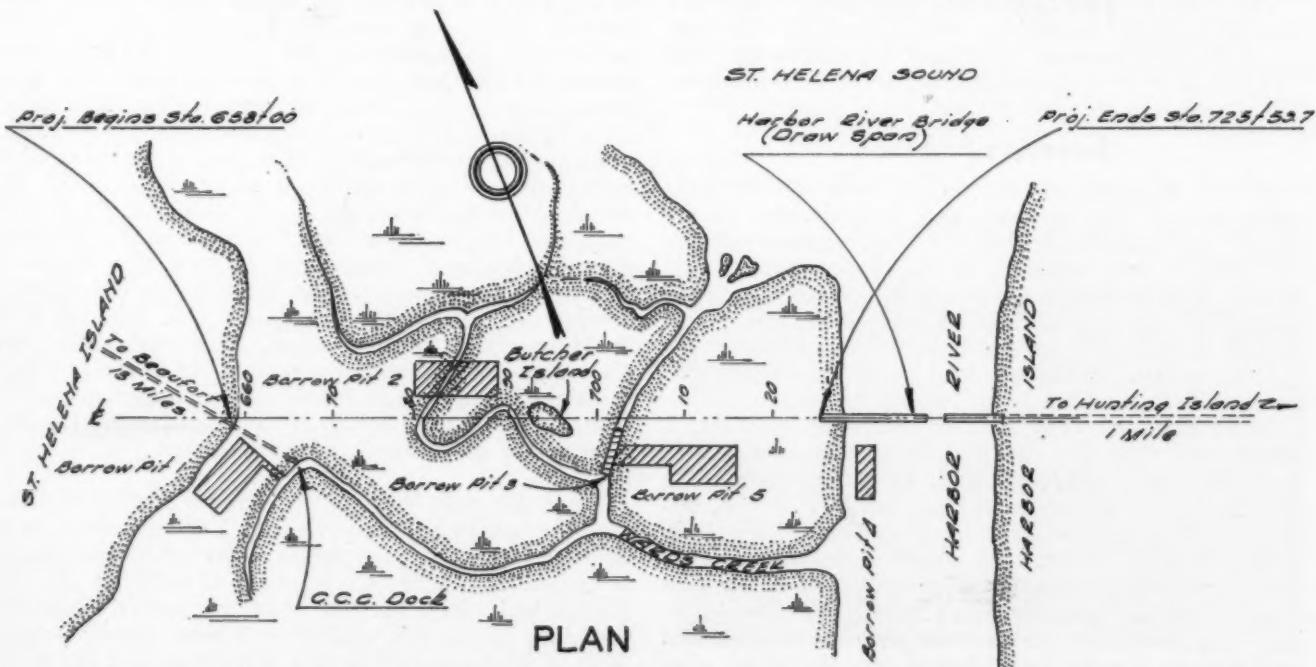


Fig. 1.—General Plan of Northwest Approach to Harbor River Bridge From St. Helena Island, Beaufort, South Carolina

marsh land with the exception of a small island which the center line crossed between stations 691 and 695. Figure 1 shows the general layout.

Historical

The causeway begins on St. Helena Island about 14 miles southeast of the town of Beaufort on S. C. Route 285. All of this region is rich in historical legend and was discovered and named in 1521 by Spanish explorers who named the eastern point of the island, Punta de Santa Elena. The early inhabitants made fortunes by planting sea island cotton and the town of Beaufort and the surrounding plantations became known all over the South for the wealth and culture of the property owners. As was the case all over the South, most of the property was lost during the war between the states, and practically all of St. Helena's Island was sold in small tracts for taxes, to the freed negroes whose grandchildren re-

zontal position. The handles were placed so that the one foot lengths were on opposite sides of the pipe and a man pulled down on the end of each of these. The tee was 1 in., and the probing pipe was $\frac{1}{2}$ in. By pulling on the end of the handle the tee would catch and bind the pipe so that it would not slip when the pipe was being forced down. Naturally the handles could be slipped up or down the pipe to any place desired, thus allowing the men to change the position of the handles as the pipe was being forced down. It was found that the elevations of the sand line determined in this manner were lower than actually found when the marsh was dredged out. This difference was not more than one or two feet and it is assumed that the force exerted pushed the pipe below the sand line.

Second Method.—The second method used consisted of rigging up lengths of $\frac{3}{4}$ in. pipe, 30 ft. of garden hose and a small gasoline water pump which was not

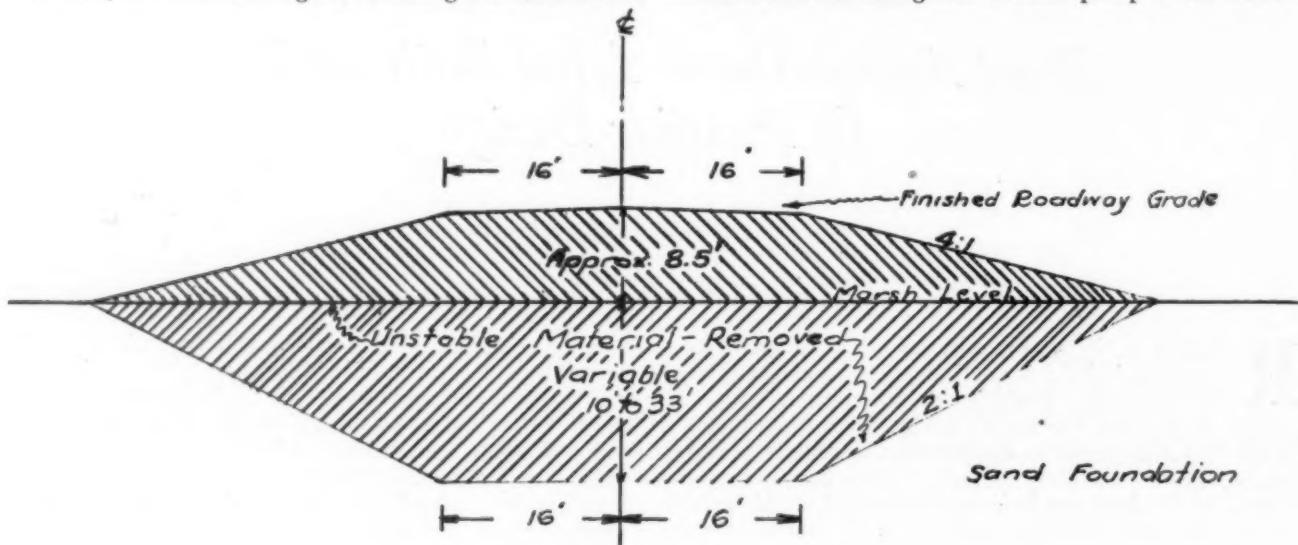


Fig. 2.—Typical Cross Section of Hydraulic Fill

tain possession of a great many of these tracts and who make up a large majority of the population of this island.

The Harbor River bridge was built under a separate contract in 1939. The bridge was constructed with concrete piles and concrete and steel superstructure. The bridge is 2850 ft. long and includes a 170-ft. draw span. The piles used were approximately 75 ft. long.

Surveying Problems

In surveying the project, original cross sections were taken at low tide in order that irregularities in the ground surface could be detected to the greatest possible degree. This was necessary at the creek crossings and also at Butcher Island as there was an average of 6.5 feet of tide which when high so covered the marsh that most of the irregularities could not be determined.

Probing through the marsh to locate the elevation of the sand bottom was done by two methods.

First Method.—The first method was to force a graduated length of $\frac{1}{2}$ in. pipe through the marsh until it reached the underlying sand. In order to force the pipe down two handles were made out of two 1 in. tees and two 1-ft. lengths of 1 in. pipe. One of the 1 ft. lengths of pipe was screwed into each tee, making each handle resemble an elongated letter "T," the one foot length being the vertical stem of the letter. The $\frac{1}{2}$ in. pipe was placed vertically at the position to be probed and the two handles were slipped over the $\frac{1}{2}$ in. pipe, with the one foot length of pipe naturally taking a hori-

to heavy to carry from one location to another. Water was pumped and the pipe was used as a jet and allowed to work its way through the marsh mud. By keeping a hand on the pipe as it worked downward, one could tell the moment hard material was struck as the movement downward changed from a smooth, uniform rate to a jerky, irregular one. The elevations to the sand line found by using this method were closer to the actual elevations.

Exploring Sub-Strata.—This jetting rig was also used to determine the quality of material underneath the marsh. Material from borrow pits was washed up and examined before the borrow pits were used. This was done by driving a 2-in. casing through the marsh to the sand, and pushing the jet through this casing, thus forcing the material up through the 2 in. pipe where it could be caught and examined. This method did not always give a representative sample due to the fact that the light material was forced out in larger quantities than the heavy material and in some instances clay and large shells were struck which were not forced up at all.

Since the most important reason for finding the true sand line was to give the contractor a definite elevation to which he must dredge, a plan was worked that proved to be satisfactory. This plan was worked out after the contractor had taken out the unstable material from the beginning of the job to Butcher Island (approximately 40% of job total) and after it was found that the probings did not give the exact sand line. The contractor was



Fig. 3.—Excavating at the End of the Bridge

given a list by station numbers of the elevations of the sand line found by probing and told to stay above this line 2 to 4 feet while removing the unstable material from Butcher Island to Harbor River Bridge. Of course, this unstable material which was left was to be removed later, but this did not work a hardship on the contractor as he had also cleaned out the portion of the project from the beginning to Butcher Island in two operations by backing up and cleaning approximately every hundred feet as the material was being removed. When the unstable material was thus removed from the Island to the Bridge leaving two to four feet of mud above sand line, a rod marked in feet and tenths with a 2 in. square bottom was used and the exact elevation of the sand bottom was found for each station by probing through the two to four feet of mud. The contractor was given a new list of elevations and was told to clean out to those elevations. This method proved very satisfactory in determining the true sand line.

Procedures During Construction

Construction work was begun by building dikes about 3 ft. high and about 65 ft. from center on right and left, running parallel to center. The purpose of these dikes was to keep the fill material which was to be pumped in, as close to the roadbed as possible. Since this work was done before the unstable material was removed, it was necessary to put the levees far enough from the center to keep them from sliding into the cut when the unstable material was being removed. This spoil material was placed to the north of the right of way to act as a protection against high tides and storms which come in from St. Helena Sound which is about $\frac{1}{2}$ mile to the north. The plans called for a bottom width of 32 ft. with slopes up from the sand foundation of 2 to 1 to marsh level as shown by figure 2. The contractor was paid a unit price for removing material between these lines; for the material removed outside of these lines he was not paid. He was paid another unit price for filling in the area between the lines mentioned above; this unit price also included the fill material above the marsh level. For the material used in fill outside of these lines, he was not paid.

Removal Around Piling.—An unusual problem presented itself when the material at the end of Harbor River Bridge was removed. The Special Provisions for the project stated that it would not be necessary to remove unstable material closer than 5 ft. to the piling, and "that work should be done so as to preclude any tendency toward unbalanced pressure against the bridge piling." The plans called for removing unstable material underneath the bridge for a distance of approximately

40 ft. Since the first and second bents are 40 ft. apart, the unstable material between these bents had to be taken out. The dredge was too large to cut this material out from the side with the cutter head without injuring the piling in manipulating the ladder and cutter head underneath the bridge.

Up to the bridge the depth of the unstable material removed was to —25.0 ft. which was about 28 feet of mud, since the top of the marsh at this point was 3.0 ft. The dredge was allowed to cut to within 4 ft. of the piling at marsh level and remained at this point while cutting to —25.0 ft. In cutting downward, the dredge ladder and cutter head naturally swung farther from the bridge piling in an arc whose radius was the length of the ladder, and when the cutter head was down to the desired depth it was cutting approximately 20 ft. from the piling. These piles were in the ground approximately 35 ft. lower than —25.0 elevation and the difference in pressure exerted on each side was reasonable. To remove the material underneath the first and second bents of the bridge it was considered inadvisable to face the front of the dredge so that the ladder and cutter head would be between the first two bents. It was therefore decided to wash the material from underneath these bents by using the discharge end of the dredge to do the washing. First, a hole was made to the right of the bridge by dredging out the material 5 ft. lower than the elevation to which the mud underneath the bridge was to be washed. This hole was made parallel to the bridge and extended several feet beyond the second bent. The excavation was kept away from the piling several feet in order that no injury be done to the piles, and was made about 40 ft. wide. When this was done, another hole was dug left of the bridge as deep as the material under the bridge was to be dug. After this the dredge was turned to face in the direction away from the bridge and pontoon lines were placed in the hole to the left of the bridge. A pontoon elbow was attached to the end of the discharge line and anchored. To this was next attached a 40 ft. length of discharge pipe. The whole was at right angles to the center line of the bridge. A cable was attached to the end of this length of pipe and by means of a small barge having a hoist on it the end of the pipe could be raised or lowered as desired, and by means of the anchored elbow the pipe could be moved toward the first or second bent by tightening or loosening the anchor line. The dredge forced water through the pipe and as the mud was washed out the pipe's position was changed. All the mud was washed into the deeper hole on the right of the bridge.

Handling Shovel Waste.—In pumping in the fill



Fig. 4.—Pontoon Carrying Pipe Line from Dredge Which Is Stripping and Wasting the Unstable Material

material, the contractor attempted at all times to pump toward one of the creek crossings. This would give an outlet for the mud and silt pushed ahead of the fill. Since there were several points where the creek crossed the roadway this was not difficult to do. Even so, it was necessary for the dredge to clean the channel ahead of the pumped in fill about every ten days in order to take out the mud pushed ahead of the fill, which could not get out of the channel.

The pipe line was placed on center line just above grade and the fill was built up by means of the discharge end of the pipe and pockets on the under side of the pipe. These pockets could be opened or closed at will so that when the fill was raised high enough under a pocket that pocket could be closed.

Pumping Around Piling.—The special provisions for the project stated that the fill should be placed so as not to cause unbalanced pressure on the bridge piling. Material was pumped from borrow pit No. 5 into the channel approximately 300 ft. west of the first bent. A very long slope was always built ahead of the fill as it grew toward the first bent and since the slope would tend to make the sand surround each pile and build up practically level on all sides, this method was the best that could be used. When the discharge end of the pipe was within 50 ft. of the bridge end, pumping was halted and the pipe was continued up to the bridge. Just before reaching the bridge a right angle elbow was attached to the pipe and the discharge end was placed about 100 ft. out to the right of center. The remaining fill up to the bridge was built up by the material coming out of the pockets. This eliminated any force that the direct discharge of material and water on the piling at the end of the bridge might have had.

Borrow Pits.—As shown on the plan, figure 1, there were five borrow pits. However, borrow pits 2 and 4 were not used as it was found that the material underlying the marsh in these pits, while it contained some sand, had too much mud and clay to insure stability when placed in the fill. The other pits contained a large proportion of shells in the sand which helped to make a very stable fill and insured a fairly good riding surface.

After the fill material had been pumped in, a dragline crane was used to bring the roadbed to grade and cross section. The top of the fill is about 8.5 ft. above the marsh and is 32 ft. wide; the slopes of the fill are 4 to 1.

Efficiency of Flat Slopes.—On August 11, after the unstable material had been removed from Sta. 660 to Butcher Island, and fill material had been pumped in place from Sta. 660 to 678 a hurricane hit the coastal



Fig. 5.—Section of Finished Fill Showing Large Number of Shells in Pumped Material



Fig. 6.—Completed Fill and Roadway Looking West From Bridge

section of South Carolina and from reports, the storm was more intense in the region adjoining St. Helena Sound than elsewhere.

The ability of a hydraulic fill as compared to other types to withstand hurricane forces was shown as a result of the storm. The other causeways in the vicinity which had been in use for years and were constructed by other methods were practically all damaged considerably and many were washed out completely. The fill that had been pumped in on this job was not damaged and no material was lost. The high tide accompanying the storm swept over the fill in places and some material was displaced along the top of the fill. The long flat slopes that had not been disturbed since the material was pumped were not harmed.

It was of interest to note that another causeway which had been built in much the same manner as this project also weathered the hurricane in good shape. It offered a striking comparison of two methods of fill construction. It was put in place by a hydraulic dredge up to a certain grade; after this was done it was decided to raise the grade 2 or 3 feet. The grade was raised by dumping material in 6 inch layers. When the storm struck, practically all of the material that had been dumped was washed away, whereas almost none of the hydraulic fill was lost.

Weathering and Settlement.—In addition to the fact that the hydraulic fill withstands weathering better than other types of fills, the fact that the unstable material was removed before the fill was placed insures it against future settlement, which is always a major consideration in the construction of causeways over marshy areas.

METHODS OF CURING CONCRETE PAVING

In our May issue we presented on page 42 a table showing the alternate methods allowed by the various state highway departments for curing and protecting fresh concrete highway slabs. Information on the methods of the Tennessee State Highway Department were received too late for inclusion in the table. The Tennessee methods are as follows:

1. Cotton mats—120 hrs. (72 hrs. special cases).
2. Burlap—120 hrs. (72 hrs. special cases).
3. Impervious bituminous coated paper (72 hrs.).
4. 2 inches wetted earth (120 hrs.).

Landscape Architects Sought for Government Service.—Landscape architects are needed now in connection with national defense housing and other Government projects. The U. S. Civil Service Commission has announced an examination to fill these positions paying from \$2,000 to \$5,600 a year. Applications must be filed with the Commission's Washington office not later than June 26, 1941.

Contractors Could Profit BY DOING MORE BLASTING

Strengths and Uses of Construction Explosives Explained

From an Interview with

ALAN J. PARISH

*Ex-Contractor and Blasting Expert,
Pres., Paris Manufacturing Co., Paris, Illinois*

BLASTING is a specialized field of construction activity. Many more cubic yards of excavation could be obtained per dollar expended for road work today if more construction men knew more about the economic use of explosives and equipment for preparing holes to receive explosives. Most of the manufacturers of explosives have a number of experts in the use of explosives on their staffs. Let it be understood that the preferable procedure whenever an excavating job arises is to call one of these experts for their advice and counsel.

Explosives generally used in construction can be divided into the following: blasting powders and dynamites. In each of these explosives there are different grades. Their exploding or detonating characteristics are rated as velocity in feet per second. This rating is a laboratory measurement made under certain particular conditions. Some high explosives explode much more quickly than others so the term "quickness" is sometimes used. The higher the speed of the explosive, the more shattering generally is the effect. Strength and density of a material to be "shot" also have an influence on the shattering effect of an explosive. So these subjects must be considered together when selecting an explosive for a given purpose. High explosives sometimes discussed or



Fig. 2.—The Result of Blasting the 240 Lb. of Dynamite Produced a Hole, Shown Above, About 20 Ft. by 24 Ft. by 15 Ft. Deep. This Showed a Ratio of About 1.2 Cu. Yds. per Lb. of Powder

mentioned are TNT and LOX. These will be explained later. They are not construction explosives.

Blasting Powder

Blasting powder is the slowest acting of all of the explosive. It has a lifting or heaving action, not a shattering action, and therefore tends to break materials into large masses or fragments. Since it is not water resistant it cannot be used in moist or wet work. Black powder must be carefully loaded into a hole and the hole well stemmed for full effectiveness because the slightest avenue of escape for the gases will seriously diminish the effectiveness of the blast.

The velocity of blasting powder varies from approximately 1,000 ft. per sec. to 1,200 ft. per sec. It is fired by means of sparks or a flame. Fuse, electric squibs and electric blasting caps are common methods of igniting black powder. In large blasts primers of high explosives are used. Blasting powders are made in only one strength and several different granulations. It is usually packaged in kegs. A word of caution is important regarding powder kegs. Never drive a hole in powder keg, even with a wooden pin. The method of opening provided by the manufacturer should always be followed.



Fig. 1.—To Determine Relative Requirements of Dynamite for a Clay Soil, Six Ten-Inch Holes Were Bored Eight Feet Deep. They Were Each Loaded with 40 Lb. of 18,000 Ft. per Sec. Dynamite. They Were Vertical Holes on 3-ft. Centers

Pellet Powder

Pellet powders get their name from the way the powder is pressed into cylindrical pellets about 2 in. long and varying in diameter from $1\frac{1}{8}$ in. to $2\frac{1}{2}$ in. The center hole in each pellet is $\frac{3}{8}$ in. in diameter so a fuse may be laced through the pellet. They are usually

wrapped in paper to form a cartridge 8 in. long. Cartridges are then dipped in parafin and packed into boxes of 25 or 50 pounds.

Pellet powders have speeds which may be classified as follows: Fast, Medium Fast, Medium, Medium Slow, and Slow. They are less dangerous to handle, more convenient to load, and more efficient and economical to use than granular powders. The wrapper effectively protects the powder from moderate exposure to dampness. Because of this, full strength of the powder is preserved over reasonable periods of storage, and the powder can be effectively used in relatively wet work. Pellet powders do not have the shattering effect of dynamites except the fast grades.

Dynamites

These are detonating explosives, i.e., they are fired by shock from an intermediate agent called a detonator. The common term used in the field for these detonators is "caps." Some of the properties of interest in considering high explosives are: velocity or shattering effect, strength, water resistance, freezing temperature, and fumes.

Dynamites are of four main classes: 1. Straight dynamites. 2. Gelatin base dynamites. 3. Ammonia base dynamites. 4. Semi-gelatins.

Various grades of some of these are made as follows:

Straight dynamite in ranges of 15 per cent to 60 per cent, is the basis upon which the strength of others is rated. The per cent noted is the actual proportion of nitroglycerin by weight in the material.

Straight gelatin dynamite is made in ranges of 20 per cent to 100 per cent.

Ammonia-gelatin dynamites range from 25 per cent to 90 per cent strength.

The latter are equal in power to straight gelatin dynamite; weight for weight. The velocities of straight, ammonia, and gelatin are approximately as follows:

APPROXIMATE VELOCITIES

Feet Per Second
Strengths of Dynamite

	25	40	60	80	90
Dynamite.....	Percent	Percent	Percent	Percent	Percent
	9,000	12,000			
	to	to			
Straight.....	13,000	16,000	18,200
	7,400	9,000			
	to	to			
Ammonia.....	8,000	10,000	12,800
	10,500	14,000		20,000	
	to	to		to	
Gelatin.....	12,500	16,000	19,700	21,000	22,300
Semi-gelatin.	12,000	13,000	14,000

The per cent strength grading or rating of any other kind of dynamite, than straight dynamite, means that it will release as much force or energy as an equivalent grade of the straight dynamite, weight for weight. Strength is the term applied to mean the power or force developed by the explosive.

The relative energy contained in the different strengths of dynamite is greatly misunderstood by many users. The common opinion or understanding is that the energy actually developed by 40 per cent dynamite, for example, is twice as much as 20 per cent. This simple ratio does not hold. The following table, published by courtesy of E. I. DuPont de Nemours and Company, shows this relationship:

Table Showing Number of Cartridges of Any Given Weight Required to Equal One Cartridge of Same Density of Any Other Strength

One Cartridge	Per Cent								
	60	50	45	40	35	30	25	20	15
60%	1.00	1.06	1.09	1.15	1.21	1.29	1.38	1.50	1.64
50%	0.94	1.00	1.02	1.08	1.14	1.21	1.30	1.41	1.55
45%	0.92	0.98	1.00	1.05	1.12	1.19	1.27	1.38	1.51
40%	0.87	0.93	0.95	1.00	1.06	1.13	1.20	1.31	1.43
35%	0.82	0.87	0.89	0.94	1.00	1.06	1.13	1.23	1.35
30%	0.77	0.82	0.84	0.89	0.94	1.00	1.07	1.16	1.27
25%	0.73	0.77	0.79	0.83	0.88	0.94	1.00	1.09	1.19
20%	0.67	0.71	0.73	0.76	0.81	0.86	0.92	1.00	1.10
15%	0.61	0.65	0.66	0.70	0.74	0.79	0.84	0.91	1.00

Now, by reference to the table we see that 40 per cent dynamite is only 1.31 times the strength of 20 per cent. These ratios, being laboratory results, may not hold strictly in the field since there is no way of controlling the conditions. Hence, in general, in changing to a lower strength it may be found necessary slightly to increase the ratio, as shown in the table, on account of the lower velocity of the detonation and the increased bulk of the charge. This may make a difference in the point of location of the charge and the degree of expansion in



Fig. 3.—In the Same Soil as Fig. 1, Two Horizontal Ten-Inch Holes 6 Ft. Apart Were Bored to a Length of 45 Ft. About 8 Ft. Below the Surface. They Were Loaded With 200 Lb. of 18,000 Ft. per Sec. Dynamite Each. The Resultant "Shot" Produced a Hole 40 Ft. by 50 Ft. by 16 Ft. Deep. This Method of Shooting Gave a Ratio of 5 Cu. Yds. per Lb. of Powder

the bore hole. A little practical experimenting in the direction of pointing and the location of bore holes, coupled with the aid of the table, will enable the blaster to select the lowest cost explosive that will do the work efficiently and economically.

Water Resistance.—High explosives differ considerably in their resistance to water. In dry work, of course, this is not a factor; but in moist or wet work it must be considered. Straight dynamites have good water resistance whereas ammonia base dynamites, in general, have relatively poor resistance. There are some grades, however, that can be used in moist places if the charge is fired immediately after loading. Gelatin base dynamites have excellent water resistant qualities. In water, gelatin or semi-gelatin products should be used.

Fumes.—Fumes are liberated with all explosives. When the work is in the open, this factor is not important, but for tunneling or confined places they are objectionable and may be dangerous. Gelatin dynamites give off the least of poisonous fumes and are generally used in underground work.

Burning dynamite gives the worst and most poisonous fumes with incompletely detonated dynamite a close sec-



Fig. 4.—Equipment Used for Horizontal Hole Boring. Five-Inch Holes Are Being Bored in Sandstone With 55 Ft. Overburden. The Holes Were 60 Ft. Long and 15 to 20 Ft. on Centers. They Were Loaded With 180 to 275 Lb. of 18,000 Ft. per Sec. Dynamite and When Shot Produced 12 Cu. Yd. of Material per Pound of Dynamite

ond. The more complete the detonation the less the fumes. It, therefore, follows that bore holes should be tightly stemmed and air space eliminated as much as possible. Overcharging is a common cause for fume production. In tunneling, for instance, at least two feet of the hole should be stemmed.

Temperature of Freezing.—Manufacturers have so perfected high explosives that they can be used without danger of freezing in all temperatures prevailing in this country. The hazardous process of "thawing the stuff" is not necessary any more.

Old Dynamite.—Dynamite will remain in good condition for years when properly stored and cared for, but it will deteriorate rapidly if improperly treated. When it gets old and deteriorated it becomes a very dark brown, sometimes almost black, gets soft and mushy, and sometimes even the cases, due to leakage of the cartridges, get discolored by dark brown stains. Dynamite in this condition should be handled very carefully, particularly if it shows signs of leakage. Old and deteriorated dynamite sometimes fails to explode, at other times it merely burns instead of detonating, giving off poisonous fumes. When in this condition it should be destroyed. A representative of the manufacturer should be consulted as to the proper method to be used.



Fig. 5.—In This Case 120 Lb. of 18,000 Ft. per Sec. Dynamite Were Used in a 5 Inch Horizontal Hole, 40 Ft. Long. It Was Placed 6 Ft. Below the Surface. The Charge Was Just Strong Enough to Lift the Debris Clear of the Hole

TNT

Trinitrotoluene is mentioned here because it has been discussed among men as a probable explosive. That with a freezing point index of about 79 has a detonating velocity of approximately 17,060 ft. per sec. in cordeau. That with a freezing point index of about 81 has a velocity of about 23,000 ft. per sec. It delivers a hard shattering blow.

It is not available commercially and therefore is not used in construction work. Furthermore, its fumes are extremely bad, and it is too expensive.

LOX

LOX is the short term applied to liquid oxygen cartridges. When shot quickly it has a velocity of 22,000 to 24,000 ft. per sec. according to the base; the straight carbon base giving the highest velocity. Since it loses about 1,000 ft. per sec. of its detonating velocity for each two minutes it is exposed to the air, it *must* be shot quickly. This fact alone has militated against its use on construction projects. It has occasionally been used in other fields so it was deemed advisable to mention it here. LOX is *not* a construction explosive.

Loading Holes

Loading is the term applied to the placing of the charge, the fuse, and the backfilling of the hole. Backfilling or plugging a hole is called stemming.

Dynamite cartridges should be slipped into the hole one at a time. If the hole is horizontal, the back of the hole should be loaded heavily, first. Light stemming for a few inches is tamped around the cartridge containing the detonator or blasting cap. This is done in order to avoid disturbing the cap and fuse or electric detonator. The hole is then backfilled and tamped tightly. Care must be taken not to injure the fuse or the wires from the electric cap.

Explosives engineers state that it is very dangerous to make definite statements regarding an operation which is so varied in its possibilities as "loading holes." The type of rock, the fragmentation desired, the spacing of the holes, the burden, the depth of the holes, the diameter of the holes, the type of dynamite available, and many other considerations enter into the subject of how holes should be loaded.

Herewith is a description of how a horizontal hole, 5 in. in diameter and 60 ft. long was loaded in a hard shaly clay soil. There was a 40 ft. high wall and the holes were spaced 21 ft. apart. A 40 per cent ammonia base dynamite was used. All that was desired was to break up the mass and to pitch it forward a few feet. In this case, 4 in. by 16 in. cartridges were used. The work was such as to require a heavy jolt deep in the mass and 100 lb. was placed in the back end of the hole. Double detonators were used to insure firing. Double detonators were hooked up in parallel but all of the holes in the blast were hooked up in series. The overburden or shot material was pitched forward where it could be loaded out. The 100 lb. charge did not extend for more than ten feet in the hole. Dummy cartridges were then packed in place and stemmed for the next 15 ft. or 20 ft. of hole when about 50 lb. more of dynamite was loaded and stemmed. Stemming was at least 15 ft. and it was tightly rammed and packed to prevent rifling. The rest of the hole was not stemmed because the bank sloped away from where the hole started. The bore hole was drilled on an upward slant, the back end of the hole was about 30 in. higher than the front end. In stemming the cuttings from the hole was rammed back after they have been placed in

bags of the size of the hole. The packing blow was hard enough to resound.

After the shot the mass was loose enough to load out easily.

In vertical hole blasting, many blasters on new work use the following as a rough basis for the first shot, and then regulate the balance of the work according to the first results: For holes up to 7 ft. deep, space apart and back from the face equal to the depth. For holes 8 to 20 ft. deep, space apart and back 8 to 12 ft. Holes of $1\frac{1}{4}$ in. diameter are generally loaded half full of explosive for the first trial shot.

Spacing

Spacing of horizontal (and vertical) holes is based mostly upon experience. A few pointers, however, may help the contractor who has need for shooting only occasionally.

It must first be decided whether the mass is to be just lifted, or if it is to be pitched a short distance. Lifting requires much less force than pitching.

It is thoroughly recognized that a shattered rock, shale, marl, packed clay, or other type of material is much easier handled by a power shovel or scraper than when these tools try to handle it in its natural state. If shattered and loosened, much greater output can be obtained per unit of time with correspondingly less wear and tear on equipment.

All spacing and loading is done on a cubic yard basis relative to the hardness or toughness of the material being blasted. Higher ratios of yardage per pound of powder can be obtained in horizontal boring if the bank ("high wall") is at least twenty-five feet. If the "high wall" or bank face drops to, say ten feet, the ratio of cu. yds. per lb. of powder drops and a shorter hole should be used. Roughly speaking, the length of the horizontal hole should be in no case more than 60 ft. and in low high walls up to twice the height of wall.

Calculating Loading.—The contractor notes that he has a hard shaly clay to handle in a 15 ft. cut. Experience with material of this kind indicates to him that he should bore 30 ft. horizontal holes on 18 ft. centers. He knows then that he has 300 cu. yds. of material to handle per hole. This calculation is made as follows:

$$\begin{aligned} 30 \text{ ft.} &= 10 \text{ yds.} \\ 18 \text{ ft.} &= 6 \text{ yds.} \\ 15 \text{ ft. (the height of the high wall)} &= 5 \text{ yds.} \\ 10 \times 6 \times 5 &= 300 \text{ cu. yds.} \end{aligned}$$

In this material, again, experience indicates that not over 7 cu. yds. per lb. of explosive can be expected for complete fracture. Since it is a tight clay and shattering is desired, the contractor selects a 12,000 to 14,000 ft. per sec. explosive which is about a 40 percent gelatin dynamite. He will need 43 lb. to do the job. This calculation is made as follows: 300 cu. yds. per hole to be handled divided by 7 cu. yds. resulting from use of one pound of explosive gives 43 lb. required.

The next cut on this project is in the same kind of material. The contractor is using a power shovel and crawler wagons to remove the material. The cut, however, is 30 ft. high this time. He decides to bore 40 ft. holes at 21 ft. spacing, horizontally. This spacing, incidentally, is about the maximum that should be used for horizontal boring. The quantity of material to be handled per hole is 910 cu. yds. This is calculated as follows:

$$\begin{aligned} 40 \text{ ft. holes is about } &13 \text{ yds.} \\ 21 \text{ ft. spacing is } &7 \text{ yds.} \\ 30 \text{ ft. high wall is } &10 \text{ yds.} \\ 13 \times 7 \times 10 &= 910 \text{ cu. yds.} \end{aligned}$$

Due to the fact that the cut is 30 ft. high, the contractor estimates that he can get nine to ten cu. yds. per pound of explosive from the shot. Dividing this into 910 cu. yds. per hole indicates that 100 lb. of dynamite per hole will be required. Since the material is only a tight clay, he decides again on a 40 percent gelatin dynamite. Had the material been harder or had it been rock, higher speed explosives would have been required.

Preparatory Work

It is quite important, when shooting large blasts, that all circuits be tested before the final shooting. Powder companies recommend correct sizes of wires to be used in connection with electric detonators for various sizes of charges and number of holes. They also recommend the strength of current to be used. Usually this is done by recommending a certain size and type of blasting machine. All connections should be out of the way of any dampness and all holes tested with a galvanometer before each shot is fired. Each hole is tested and then the whole circuit is tested.

It should be pointed out that series wiring is practically always recommended. Parallel wiring for blasting caps is never used with a blasting machine but parallel series may be if all conditions are favorable and all calculations have been properly made.

Mudcapping

Mudcapping is known by a variety of names, such as "bulldozing," "plastering," and "blistering." It is used to break boulders and large rocks that lie practically on the surface of the ground. High velocity dynamites are used because they have the effect of "hitting down." One method of mudcapping is to remove the required amount of dynamite from the wrappers and pack it in a heap over the spot where the rock would be struck with a hammer to break it. The wrappers are placed over the dynamite, after the cap and fuse have been placed, and the whole covered with a plaster of heavy, thick mud a few inches deep. Where there is a great deal of this work to be done the cartridges are usually just split, tied together, capped and packed with mud on the boulder.

If the boulder is embedded an appreciable amount in the ground a hole should be punched under it and a stick of dynamite fired in the hole to roll the rock out onto the surface. Never mix gravel or stones with the mud because the blast will throw them like they were bullets. Use only a thick mud and cover the whole explosive about 5 or 6 in. deep.

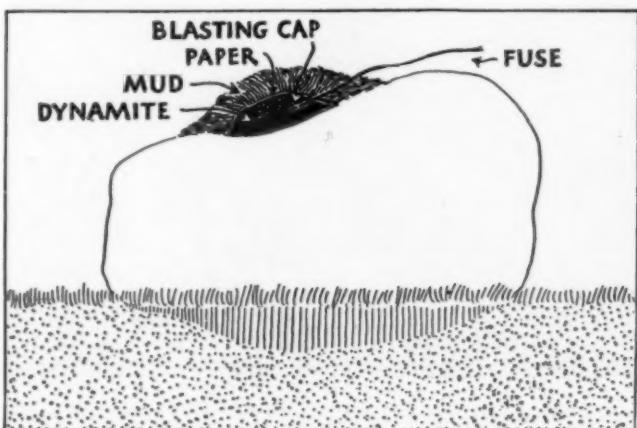


Fig. 6.—How a Boulder is Mudcapped

Discussion on

SUPERHIGHWAYS IN NORTH CAROLINA

*—What Do We Have?
—What Do We Need?*

By JAMES S. BURCH

*Engineer of Statistics and Planning
North Carolina State Highway and
Public Works Commission*

SUPERHIGHWAY" is a term loosely used to denote any highway which is wider, straighter, faster, and safer than the normal highway. Other terms used are express highways, freeways, and rural boulevards. Perhaps the best definition of a superhighway is that it is a road designed and built for abnormally high volumes of traffic; or, briefly, a "high capacity" highway. The ideal is the much publicized four lane divided type. This type is yearly becoming more prevalent, more than 500 such sections having been built in the Nation within the past decade.

The prevailing type of highway in North Carolina and the United States has two adjacent lanes, one for traffic in each direction, and the paved portion is from 16 ft. to 22 ft. wide. Such a road constitutes 98 percent of the nation's highways, and will probably represent more than 90 percent of them for the next ten years. An existing two lane road is likely to contain fairly sharp curves, and many "blind spots"; or sections where the driver's sight distance is limited by hilltops or curves. Steep grades in rolling country are not unusual; and side access, such as from driveways, local roads, filling station entrances, etc., are neither limited nor controlled, and these may occur every few hundred feet, or closer.



Newly Constructed Section of U. S. 29 Between Salisbury and China Grove, N. C. The Pavement Is 40 ft. Wide and Consists of Two 11 ft. Concrete Pavement Lanes and Two 9 ft. Bituminous Concrete Lanes. The Project Was Built on an Existing 7 in. Macadam Road and the Construction Was Done Without Detouring Traffic, and Without Accidents (see page 46, ROADS AND STREETS, May, 1941). Traffic Density Is About 5000 Vehicles Per Day

The satisfactory service capacity of a two lane rural highway, depending upon the prevailing safe speed, traffic composition, and many local situations, is about 400 to 800 vehicles per hour. Of course, at low and uniform speeds with close vehicle spacings, such as in football traffic, the road will accommodate considerably more than these limits. In fact, we made traffic counts this winter on N. C. 87 near Fort Bragg when this two lane road was being used by more than 1400 vehicles in an hour. Such conditions on rural roads, however, are extreme and intolerable from the standpoint of delay, high cost of transport, driver irritation, and the creation of accidents.

Traffic Capacity

One of the interesting and illuminating findings of the Highway Planning Surveys is that about 80 percent of the rural trips are less than 20 miles in length. Since one terminus of each trip is almost always at the driver's home community, high traffic volumes are definitely tied to high population areas. In North Carolina—more than in most states—our traffic, like our population, is quite dispersed. High rural traffic is found only in proximity to high population areas, and our population is spread out more than in most of the eastern states. The population of our state is 73 percent rural. The urban 27 percent is spread throughout 488 towns, and 66 percent of these towns have less than 1,000 population. In fact, there are only 26 towns with more than 10,000 population, and only one town of over 100,000 in the state. North Carolina has well been termed "A rural state of many small towns".

Our paved roads likewise are well dispersed to serve the population and traffic. Our rural hard surface mileage per square mile of state area is larger than in the average state; and our high and medium type mileage per unit of area is greater by 53 percent than for the nation as a whole. For these reasons, although our traffic is large in total, it is well dispersed; and thus, we have relatively few sections where "high capacity" highways are, or will be, needed or justified for many years.

High Capacity Roads Already Built

On the state highway system, we have a total of only 94 miles of rural hard surface of more than two lane width. This length is divided into some 64 miles of three lane road, and 30 miles of four lane road. All of



Divided 4-Lane Concrete Pavement with Wide Grassed Dividing Strip on U. S. 29 North of Concord, N. C.

these are located on heavy traffic volume sections, and all but a very few miles are located within the metropolitan area of cities of over 46,000 population, and radiate from such cities. The traffic on these three lane and four lane roads runs from about 3,000 to 7,000 vehicles on the average annual day; and these roads almost invariably carry two or more numbered routes.

Probable Present Need

We now have about 68 sections of two lane road in the state, involving about 147 miles, where the traffic may now justify widening with additional lanes. Some of these are borderline cases, requiring further study as to need. All of them are suburban or near suburban.



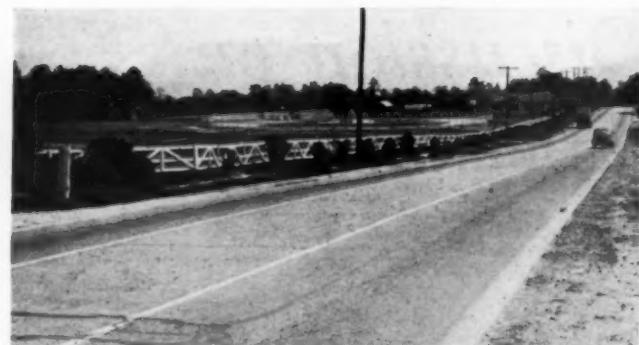
Fully Landscaped 4-Lane Divided Suburban Highway on U. S. 421 West of Greensboro, N. C. This Section Carries About 3300 Vehicles Per Day

A few of them are now being widened, or plans are under way for their widening with additional lanes.

Advance Planning

With the traffic data available from the Highway Planning Survey, it would not be a very difficult matter to select, from five to ten years in advance, those sections of the system where "high capacity" roads will be needed. These studies would involve trends in population, gasoline consumption, registration, average wealth, and previous traffic growth; and could be revised annually to more accurate values. It is believed that in almost all cases traffic forecasts could be made on individual sections with reasonable accuracy five years in advance, and fairly good estimations could be made ten years in advance (disregarding the effect of war or catastrophe).

Such potential needs could be studied in connection with each other, with the consideration of by-passes, alternate routes, railroad and highway grade separations, major bridges and other factors; and certain sections could be selected for inclusion in a major highway plan for the future. Steps could then promptly be



Three-Lane Bituminous Concrete Pavement on U. S. 70 East of Greensboro, N. C., Which Has Given Excellent Traffic Service for About 10 Years. It Carries About 4700 Vehicles Daily

taken to obtain adequate property options or easements, or other appropriate agreements could be made concerning right-of-way and property treatments, *to become effective five years later*. It is believed that most of the property owners could be induced for a reasonable consideration *now*, to make grants and agreements to be effective far in the future. Also, future property developments could be made to conform with this pre-conceived plan, and thus the high cost and delay of the ultimate road improvement could be avoided. The right-of-way and property cost has been so excessive in many recent cases as to render impossible the construction of



Recently Completed 4-Lane Concrete Highway With 4 ft. Bituminous Dividing Strip on U. S. 29 North of Charlotte, N. C. Traffic on This Section Is About 5000 Vehicles Per Day

several "high capacity" sections with available funds, no matter how great or urgent was the need.

Practical Limitations

It is seldom that physical features and cost limitations will permit an ideal superhighway design. These complications, together with losses in the previous road investment, make such a superhighway hard to justify—even under high traffic volumes, unless the previous highway has been laid out with this plan in view.

Because of practical considerations of cost, it is well nigh impossible for the highway engineer to adopt such standards, or those visionary designs promoted in the popular press. Each proposed job has its own special problems and limitations, and the best procedure is to approach the ideal as nearly as conditions will justify and funds will permit, keeping safety always paramount, and making provisions for further future development at each stage.

Three Lane Roads

While many national highway authorities frown on the three lane pavement as being quite dangerous, it is

felt that this design has a definite place, and adequately serves an economic traffic need; provided it is not operated under traffic volumes exceeding the safe capacity; and provided adequate sight distances are included at all points in the design. The three lane type has operated quite successfully in many places in North Carolina, and available accident data do not justify a contention that this type is any more dangerous than the two lane for the same number of vehicle-miles. Since the three lane has a much higher capacity than the two lane, it represents an economical type as a stage development for later conversion to a four lane divided design; with some loss of old pavement naturally being involved.

In North Carolina, we have, and will need only (about 147 miles) a limited mileage of superhighways or "high capacity" highways; since they can be justified economically only where present or potential traffic volumes require them. But we most certainly do need, and shall need such highways on many heavily travelled sections. A road carrying 3,000 vehicles per day earns about \$5,500 per year per mile, and double this figure for a traffic of 6,000. Such sections usually occur in suburban areas, where property complications are most serious. We should now anticipate our future needs, and take steps that these needs may be accommodated at the proper time, at a minimum of cost, delay, and disorder.

● POWERS' CATALOG COLUMN ●

POwers' 1941 edition has brought a most gratifying response. Not only has there been specific praise from many sources and many angles; but the demand for copies has exhausted the supply reserved for special requests, so that much to our regret we are having to refuse applications from people to whom we should like to send. This in spite of the fact that we printed and bound nearly 1,000 more copies than contracts with our advertisers called for.

As expected, the feature receiving most attention was the improved and expanded collection of equipment specifications; and in accordance with our announcement in this column last month, we here list the changes which have been announced since publication of the tables in April.

Specification Changes

J. D. Adams Company

	Previous	Present
		Revised
CARRYING SCRAPER No. 100		
Capacity (Heaped) cu. yd.	11.8	12.5
Capacity (Struck) cu. yd.	9.5	9.8
Weight (Approx.) lb.	19,985	18,950
Height (Over all)	9'9"	9'6"
Cut (Max. Depth)	8 1/4"	10"
Ground Clearance	21"	18"
Spread (Max. Depth)	22"	19"
Tractor Recommended, H.P.	70-80	70-100

MOTOR GRADERS Nos. 303 and 304

No. 304 supersedes No. 303. The new model uses the U-9 power unit (50 H.P.) instead of the U-10 (45 H.P.). This is the only change aside from the slight effect it makes in appearance.

American Steel Works

TAMPING ROLLERS

The company announces a new line similar to their standard line, but equipped with dust and moisture-proof self-aligning bearings. They will continue to manufacture the standard line, in which tapered roller bearings are used.

Flexible Road Joint Machine Co.

CONCRETE FINISHING MACHINES

Gas-Electric, Gas, or Diesel

Shipping weight. The weight of 13,270 lb. given in the catalog is for a 20-ft. machine. For

the various sizes in the full line of machines, weights range from 4,000 to 36,000 lb.

Length of transverse adjustment varies from 2' to 10', according to size of machine.

Shipping length is 9'4". The length of 7'7" in the catalog is main frame length.

Height to top of engine is 5'4", height to top of deck is 2'0".

Huber Manufacturing Co.

The changes noted below were made prior to the publication of Powers' Catalog in April, but notice of them was received too late to permit revision in the original tables.

	Present	Previous	Revised
ROAD ROLLER—			
5 and 6-Ton Size			
Front Roll Diameter.....	24"	24"	34"
ROAD ROLLERS—			
7 and 8-Ton Size			
Power Unit Make & Model (Buda) .H326	H298		
Piston Displacement, cu. in.....	326	326	298
ROAD ROLLER—10-Ton Size			
Power Unit Make & Model (Buda) .K369	K393		
Piston Displacement, cu. in.....	369	369	393
ROAD ROLLER—12-Ton Size			
Power Unit Make & Model (Buda) .K426	K428		
Piston Displacement, cu. in.....	426	426	428

Koehring Company

	Present	Previous
CARRYING SCRAPER WH 12.5		
Length Overall		
(Scraper with Tractor)	30'3 1/8"	30'2 1/8"
Width Overall	9'6"	9'10"

CONCRETE PAVING MIXER 34E

Drum Diameter	77"	77 1/2"
Drum Length	102 1/2"	101 1/4"
Drum Track Diameter.....	73 5/8"	73 3/8"
Boom Length	30'0"	35'0"
Traction Tread Shoes.....	18 1/2"	17"

Power Unit. (Beside the gasoline engine listed in original specifications, this mixer is available with diesel engine, G.M. Model 471, 2-cycle, 4 cyl., bore 4 1/4", stroke 5", 1560 R.P.M.).

Wausau Iron Works

SNOW PLOW WING TM-2

This is an addition to the previous Wausau line. It is intended for trucks of 2 1/2 to 5 tons capacity, and is patterned after the TM-1, except that it is longer and somewhat heavier. (The TM-1 wing is for trucks from 1 1/2 to 2 1/2 tons). Standard length of TM-2 is 8'0", but it is also available in 9'0" length. It is operated by heavy duty Commercial Shearing pump.

OBSERVATIONS BY THE WAY

By
A. PUDDLE JUMPER



¶ A deep-etched contrast strikes the motorist crossing from Florida into Georgia on U. S. 319 when he notes the roadside development work of the two states. Neel, you should ease up the contrast a bit. In fact, U. S. 319 north of Tallahassee, Fla., is a fine example for the rest of the state to follow.

¶ Action without thinking is fatal; thinking without action is futile.

¶ Georgia contractors, material and equipment men are being paid off in "Certificates of Indebtedness" issued by the state. The state is broke so far as clear highway funds are concerned. So these "Stiff Tickets" merely acknowledge a legitimate debt of the state. They are non-interest bearing and the banks will discount them at 3 percent per annum if a contractor needs cash. They were nick-named "Stiff Tickets" as a contraction of the way a "Suth'n Genman" says "Certificates" rapidly. There was no irony or cynicism involved.

¶ Gray moss is attractive to the "snowbird," but green trees are more attractive. Florida, South Carolina, and Georgia should remove most of the moss from those big oak trees along the highways or the moss will kill the trees. The trees are far more attractive green than dead, and present than absent.

¶ Imagine for yourself what must be the feelings and attitudes around the Georgia Highway Department when the following is a salutation that replaces the world wide "good morning":

"Who's been fired today?"

Upon my honor those are the first words passed between business associates in the office of the State Highway Department on a bright morning when I called there and was waiting in the office.

¶ If a motorist wants to avoid the wet spots in the road, he should avoid the wet spots along the road.

¶ The "Stop" sign shown here is the biggest one I ever saw. It is in South Carolina at the junction of State Route 31 and U. S. 15. The octagonal part is taller than my car, shown below it, and it is mounted



on poles that project above the car. The letters are reflectorized.

Aside from a few junctions protected this way, signing at junctions, and approaching thereto, needs improvement.

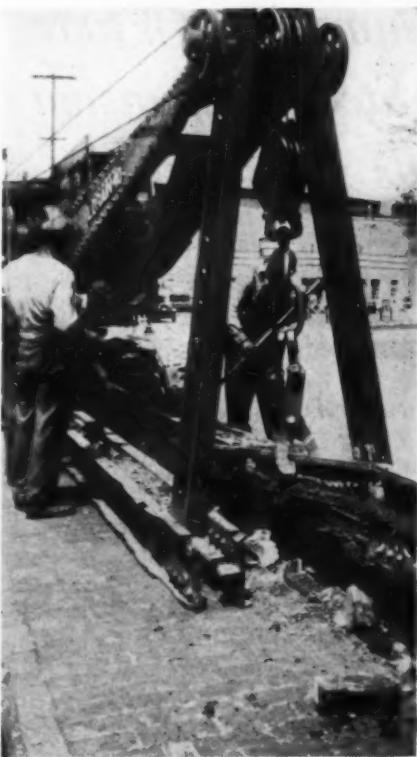
¶ O. B. Johnson is sales manager in West for the Dayton Company (who have one plant in Denver). He was feeling pretty good after the cocktail party at Casper and enthusiastically he said, "Ole Johnson he say the Dayton Company make more belts accidentally than all other companies do purposely." 'S funny how cocktails work.

¶ The maintenance patrolman on Kansas State Route 13, north of El Dorado, in Chase County, should take a few pointers on how to maintain a gravel road from his patrolman friend to the south in Butler County.

¶ A friend is the first one who steps in after the whole world has stepped out.



¶ Ripping out street car rails of an abandoned street railway track in Indianapolis was "easy as pie" with this device. The channel framing resting



on the pavement carried clear back under the power shovel body. This framing was held down tight against the pavement under the power shovel.

¶ I thought the following convention notice was pretty good, so let you in on it. It was sent out by the Casper Chamber of Commerce.—A. P. J.



We know you are planning on attending the biggest, rip-roaring, hair-raising convention ever sponsored by the Western Association of State Highway Officials when they meet in Casper on June 17 to 20 inclusive.

Casper, is, beyond contradiction, one of the best and snappiest convention cities in the good old U. S. A., and if four days in this community doesn't run your battery down or knock your ignition system out of commission, you will be good for another 100 years.

Excellent convention facilities, luxurious hotels, five night clubs with dance bands operating every evening of the week and the sandbar for bathing, stargazing and other forms of outdoor recreation. GOOD HIGHWAYS, AL-

THOUGH A LITTLE ROUGH, SMOOTH IN SPOTS, SLIPPERY, HOLEY IN PLACES, DUSTY, BUT HOWEVER PASSABLE AND BEST SUITED FOR DARK NIGHT DRIVING WITH DIM LIGHTS AT A SPEED OF 100 MILES AN HOUR IN A CAR EQUIPPED WITH SMALL WINGS. (HI FRANK.)

If you miss this one, we will always be convinced that you have high-blood pressure, heart trouble, softening of the skull or that your wife wears the pants. DON'T BE CONSPICUOUS BY YOUR ABSENCE.



"Hi Frank" is a salute to Frank Kelso, Superintendent of Highways, Wyoming State Highway Department. I wonder what it means.

¶ On that 10 miles of new 4-lane road west of Lexington, Ky., reflector buttons were set in the curb on curves. Tom Cutler missed a bet on

this road. He should have used New Jersey's reflecting curb design. Snow plows and traffic have eliminated many of the reflector buttons.

¶ Then there was the little girl who ate buckshot and her hair came out in bangs.

¶ In North Carolina I noticed two traffic aids that should be favorably mentioned. Both of them were a big help to me. They were signs along the road which read as follows:

THIS IS U. S. 158
WEST

YOU ARE ON U. S.
601 HEADED SOUTH

¶ I thought you might be interested in reading this take-off on the income tax return blank. I hope you can read the fine lettering.

1941	Individual Deficit Return			1941
FOR NET RETURNS OF NOT MORE THAN \$5,000				
Derived from Poker, Bridge, Horses, Crap Games and Pay Days (BEFORE PREPARING THIS RETURN, READ CAREFULLY "TEN YEARS IN STIR" BY AL CAPONE)				
PRINT NAME AND BOOKIE OR RESIDENTIAL ADDRESS PLAINLY BELOW				
(Street and number, or rural route)				
(Post office)		(County)	(State)	
Is this a joint return? _____ Where is the joint? _____ Living with wife? _____ Why? _____				
Did you file your return last year? _____ How much did you file? _____ (Cut it out faster)				
DEFICIT				
1. WAGES _____ \$ _____ 2. DIVIDENDS (Don't be foolish—1929 is over) _____ 3. INTEREST (Or have you lost it—New Deal, etc.—you know?) _____ 4. TOTAL INCOME _____ \$ _____				
DEDUCTIONS				
5. CONTRIBUTIONS PAID One Armed Bandits _____ \$ _____ Punch and Mass Boards _____ Paid to Better Golfers _____ Paid to Better Poker Players _____				
*If you have no entries under these headings we think you are poor. Also, you mother, don't collect items from pens pocketed by wife while you sleep.				
6. OTHER DEDUCTIONS: Mother-in-Law _____ \$ _____ Uncle Jake _____ Aunt Mamie _____ Merry Christmas from your Three Postmen _____				
7. TOTAL DEDUCTIONS in 5 & 6 _____ \$ _____				
COMPUTATION OF DEFICIT				
8. Income _____ \$ _____ 9. Net Income _____ \$ _____ 10. Less personal exemption in degrees Fahrenheit, divided by net weight at ringside less two no trumps. If you trump anything higher than jack of spades see special instructions, but don't kill wife. _____ \$ _____				
11. Balance of Net Deficit Taxable _____ \$ _____				
GENERAL INSTRUCTIONS				
I/we swear I don't know what this is all about and that I'm sick and tired of the whole mess and if this keeps on I'm going on relief. Place!				
Subscribed and sworn to before me this _____ day of _____ 1941. _____ Signature				
INSTRUCTIONS FOR FILLING OUT RETURN				
Check carefully the following items: GROCERIES HOUSEWARES PAINTS AND GLASS FERTILIZERS PRUNING NEEDS CUTLERY GARDEN NEEDS GIFT COOKIES SPRAY NEEDS HOUSECLEANING NEEDS				
A. If your purchases for the calendar year have been from Shookley's Hardware Store, you have saved money and the amount should be entered under A-43. This will be accepted by the auditor as evidence that you know how to buy economically and that you have conducted your business in the right manner.				
B. If you purchased on the above items and others have been obtained elsewhere, you have lost money and it is not necessary to fill out this blank. Use form No. B-44 application for deduction.				
C. The third alternative is to buy a Bendix Home Laundry, Roger Gas Range, Philco or RCA Radio, Phonograph, Westinghouse Refrigerator, Conair Ironer or Electric Stove. These will give you no much employment — save you no much money and give you no much more health than you won't mind filling out income taxes. But above all do remember to buy from Shookley's.				

STEEL OUTPUT AND USES

Steel Production Capacity—Steel Consumption—Where Steel Production Goes—Defense Uses for Steel—Expansion of Steel Capacity—Raw Materials for Steel

THAT there will be enough steel not only for National defense needs, and for export purposes but also a greater tonnage for domestic civilian use than was available in any earlier year is brought out clearly in a little booklet issued a few days ago by the American Iron and Steel Institute. This booklet, containing 54 questions and their answers, contains so much information of interest and value that we are reprinting it in full.

Steel in National Defense

How important is steel to national defense?

Steel is a necessity for almost every type of defense equipment—battleships, planes, guns, ammunition, tanks and mobile equipment of all kinds, as well as the machines and tools with which to make them.

Are steel consumers who make products for the defense program getting preferences in deliveries?

From the outset of the defense program the steel industry has voluntarily given first call and right of way to orders devoted to that cause.

How has the steel industry organized itself to cooperate with the army, navy and other branches of the government on defense matters?

Acting upon the request of the Office of Production Management, the chief executives of 40 steel companies have organized themselves as an Iron and Steel Industry Defense Committee. That committee will work for close cooperation between industry and government, and help speed output. Another committee of expert metallurgists works with government agencies in preparing and revising specifications for steel products, and also advises with steel consumers on specification problems.

How much steel can the nation's steel industry produce?

At the end of 1941 the capacity will be 87,400,000 tons.

How does our country's steel capacity compare with that for other countries?

World steel capacity outside the United States is estimated at 105,000,000 tons per year. "The Iron Age" estimates foreign steel production in 1940 as follows: About 42,500,000 tons were produced in continental Europe excluding Russia. Russia produced 21,800,000 tons and the United Kingdom produced 15,000,000 tons. About 7,100,000 tons were produced in Japan, and 2,000,000 tons in Canada. Steel production in all other countries was estimated at 4,100,000 tons, bringing the total production for the world outside the United States to 92,500,000 tons. Out put last year in this country was close to 67,000,000 tons.

Capacity to Produce Steel

What percent of the world's steelmaking capacity is in the United States?

About 44 percent.

How does our present steel capacity compare with that of 1918? Of 1929?

It has increased almost 40 percent since 1918, and fully 15 percent since 1929.

Has the increase in steelmaking capacity kept pace with population gain?

Yes, it has far outstripped population gain. The nation's present population is only 8 percent more than in 1929, and 27 percent more than in 1918.

Was any of this new capacity added last year?

During 1940 about 2,500,000 tons of annual capacity were added, and plans are now under way to increase capacity by another 3,400,000 tons during 1941.

Operations of the steel industry have been reported at over 95 percent of its capacity for some months. How long can they continue there?

So far there is no apparent strain on producing facilities. Actually some companies have recently been producing in excess of 100 percent of "rated" capacity. In 1917 the entire industry operated at 100 percent or over for seven months.

How can any company operate at more than 100 percent of its "rated" capacity?

The reason is that the "rated" capacity of the industry is the sum total of maximum output attained in any recent year by each furnace in the industry, less about 11 percent which is taken off for shut-downs and repairs. Thus, the "rated" capacity is not the production ceiling. As a practical matter the industry could, by reducing the length of the shut-downs, lift output as much as 2.5 percent above its "rated" capacity in a year and for shorter periods it could probably operate at an even higher rate. It follows that the industry has a "practical" maximum capacity considerably higher than its "rated" capacity.

What could the industry produce if called upon to operate at its highest "practical" capacity in 1941?

If necessary, it probably could produce as much as 86,000,000 tons, not counting production from the new furnaces that are now being installed, and in 1942 it could produce approximately 90,000,000 tons. The maximum for 1941 would be about 20,000,000 tons more than the industry actually produced in 1940.

Ability to Consume Steel

Would 86,000,000 tons be enough for defense needs, for exports and for other needs?

It is estimated that when the defense program gets in

full swing a total of 8,000,000 tons may be used for defense in a year, and another 12,000,000 tons for export to Great Britain, Canada, South America and other countries—about 20,000,000 tons in all. That would leave at least 66,000,000 tons of steel which could be turned out for domestic civilian use.

How does that tonnage compare with what has been needed for ordinary commercial uses in the past?

In 1929, the best peace-time year on record, the domestic use of steel was equal to 57,500,000 tons of ingots, or 950 pounds per capita.

What does 66,000,000 tons represent on a per capita basis today?

It figures out to 1010 pounds per capita, or 6 percent more per capita than was needed in the boom year of 1929.

What was peak production of the steel industry in the United States before, during and after World War I?

Before the first World War, the peak year of steel output was 35,057,000 tons in 1913. Biggest output during World War I was 50,468,000 tons in 1917. A later peak was 63,205,000 tons in 1929. All these earlier records were broken in 1940 when 66,993,000 tons were produced.

What was the rate of steel output in 1940 relative to capacity?

Steel output in 1940 represented 82 percent of the industry's "rated" capacity as of the end of 1939. It would represent less than 78 percent of the present "practical" capacity.

Did steel output rise in response to the defense program in 1940?

Yes. Early in the spring of 1940 the industry was running at only 60 percent of capacity, while in the last quarter of the year the rate of operations averaged nearly 96 percent.

Where Steel Production Goes

Was this production for use in the United States alone?

In large part, although heavy shipments were made to England and her allies.

How much steel did we export during 1940?

Almost 11,000,000 tons of ingots were used to make steel for export last year. More than half of the exports went to the United Kingdom and Canada.

How do those exports compare with earlier years?

The 1940 total was over three times exports in 1939, about three times the 1929 total, and exceeded the previous 1917 peak by fully 25 percent.

What was done with the steel made and used in this country last year?

Preliminary estimates indicate that about 11 percent of the finished steel shipped to consumers was used in the construction of highways, cantonments, dams, bridges and factories, including a good deal of defense plant construction. About 16 percent went to the automotive industry to build passenger cars, trucks and mechanized military equipment. The railroads took 8 percent, and another 7 percent was used to make tin cans, steel drums and other containers.

That accounts for about half of the total. Where did the rest go?

To machinery and tool makers, to industries that press or stamp steel into various products, to ordnance makers, ship-builders and to a host of other industries from manufacturers of watches to airplane engine producers.

Defense Uses for Steel

How much steel is needed to make a battleship?

A big 45,000-ton battleship will require about 20,000 tons of ordinary steel, an aircraft carrier about 17,000 tons, a cruiser about 5500 tons, and a destroyer about 700 tons. These tonnages do not include the steel in the ship's guns and defensive armor.

Building a "two-ocean" navy will take how much steel, on that basis?

It has been estimated that, exclusive of guns and armor, the total number of naval vessels now under construction or appropriated for will require less than 1,200,000 tons of steel, spread over the next four years.

How does that amount of steel compare with what the automobile industry uses, for instance?

In 1940 the automobile industry consumed approximately 7,185,000 tons of steel.

How much steel is used in building airplanes?

To build one of the bigger planes like a transport or a heavy bomber requires at least five tons of high grade alloy steels. Steel accounts for almost half the weight of both the fuselage and the engines. To build 50,000 airplanes of various types would require at the most 250,000 tons of high quality steel.

Has there been any change in the types of steel used for military and naval equipment since 1918?

Yes. Better steels have been largely responsible for the faster ships, planes and tanks of today, for the higher powered and more durable guns, and for the more effective armor plate.

What types of steel products are used for those purposes?

Almost every kind. To build a battleship, for instance, takes steel plates, structural shapes, wire, sheet steel, tubular products, bars—in fact practically the whole range of products. Even tin plate has military importance in preserving food for military and naval use, while barbed wire likewise has a part to play in defense.

Can the American steel industry produce the high quality steels needed for defense?

It has been producing them for years. With only a very few exceptions, such as armor plate, the steels which are used for defense equipment are also important in peace time. Thus in the years before the present emergency, the steel industry acquired the ability and equipment to produce in vast quantities the steels now needed for defense.

Do steel companies themselves make defense equipment, or are they primarily a supplier of steel to companies that make such equipment?

The steel industry is primarily a supplier of steel to other companies which fabricate it into defense equipment. Two of the larger companies in the industry are equipped to build naval vessels and merchant ships. Some steel companies also make armor plate and certain other heavy ordnance equipment.

Delays and Shortages in Output

Have there been any shortages in particular kinds of steel?

The answer is "No"—for the main body of steel products, but "Yes"—for a few special kinds of steel such as stainless steel and high speed tool steel, shapes and plates.

What caused these shortages?

One of the important alloys in stainless steel is nickel, and early in 1941 the supply of nickel became tight. In the case of high speed tool steel, tungsten supplies also appeared somewhat inadequate.

Are most other steel products in ample supply?

Because of the great rush of orders, mills are booked ahead for some months on various products such as plates and structural shapes. Users are anticipating their needs well in advance and scheduling their orders accordingly. Instead of the "hand-to-mouth" buying which prevailed throughout the depression, the former practice of forward buying has returned. The present situation for the bulk of steel products is one of somewhat deferred deliveries, but that is not a shortage.

There has been a shortage of aluminum. Does this bother the steel industry?

It does to some extent because the steel industry uses pure aluminum to remove gases from molten steel. Annual requirements of aluminum in steelmaking are not great as compared with consumption by other industries, but no completely satisfactory substitute exists today.

Have no bottlenecks appeared in any departments of the steel industry?

The nearest thing to a bottleneck was in electric furnace capacity. These furnaces make special quality alloy steels, and because of the sharply increased demand for these steels in the manufacture of airplane and tank engines and parts, and for other uses, the steel industry's former electric furnace capacity was inadequate. It is being expanded by 50 per cent to a total capacity of close to 2,900,000 tons per year. From time to time expansions have been made in other departments to keep the various kinds of producing facilities in proper balance with each other.

Expansion of Steel Capacity

What about other types of equipment?

There was also a need early in 1941 for new coke ovens and blast furnaces, and these are being built, as well as new open hearth steelmaking furnaces. Also a number of Bessemer converters recently retired from active service are being put back into use.

An expansion program like that must cost a lot of money. How much?

The steel industry is spending \$282,000,000 for new equipment and construction during 1941. In 1940 it spent \$171,000,000.

How much was spent in the preceding 10 years?

From 1930 through 1939, about \$1,500,000,000 was spent by steel companies on new equipment and modernization.

Were those years poor ones for the steel industry?

They were. Over that whole decade the industry earned an average of less than 2 per cent on its investment. Net earnings of the entire industry averaged \$50,000,000 a year, or about one-third of its average yearly expenditures for new equipment and modernization. Earnings of previous years and borrowed money were used to meet the cost of new construction.

Was it wise for the industry to spend all that money to enlarge and improve its plants in bad times?

It was not only wise, but it is most fortunate for the country that the steel industry was "geared up" for unprecedented production when the armament program appeared.

Is any considerable proportion of steel facilities outmoded or obsolete?

No. As a result of large expenditures in recent years, it is estimated that more than 90 per cent of the industry's facilities are modern and up-to-date and capable of efficient production. Substantially all of the remainder is in operating condition, but is less efficient and economical.

You have mentioned electric furnaces. Are they more up-to-the-minute than open hearth furnaces?

They are not comparable that way because each has its own job to do. Electric furnaces are used chiefly to produce special kinds of alloy steel, while open hearths are used primarily to make the carbon steels which comprise the great bulk of total steel output.

What is the Dunn report on the steel industry?

It is a report to the President prepared by Mr. Gano Dunn, well known engineer on the staff of the Office of Production Management. The report showed that military and export demands this year and next will absorb only 25 per cent of the nation's steel capacity, leaving more steel available for domestic civilian use than was taken in any previous year.

Is the industry spread out geographically, or concentrated?

Its plants are spread from coast to coast, in more than 250 different communities in 28 states. The largest centers are around Pittsburgh and Chicago.

The Raw Materials for Steel

Is the steel industry dependent on foreign sources for raw materials..

Certain essential raw materials must be imported, but these represent less than one-half of one per cent of the total tonnage of raw materials consumed annually by the steel industry.

Which raw materials must be imported?

Among the more important materials that come from abroad are manganese, tin, chromium, cobalt, tungsten and vanadium. Nickel is also imported, but principally from Canada.

Where do these imports come from?

Manganese from Russia, Brazil, Cuba and Africa; tin from Malaya, the Dutch East Indies and Bolivia; chromium from Africa, Cuba, Greece; cobalt from Canada, Africa and Australia; tungsten from China and Malaya; vanadium from Peru and Rhodesia.

How are these other metals used in steel making?

In three principal ways: 1, to purify steel; 2, to impart special properties to alloy steels; 3, to serve as a corrosion-resisting coating on steel.

What steps are being taken to insure an adequate supply of the materials which have been imported?

The government is purchasing reserves of some, like manganese and tin, and is also fostering domestic production. The steel companies themselves have also laid in larger than normal stocks of certain materials.

Do we have enough iron ore in the country to meet our present needs?

The nation's resources of iron ore are more than adequate, as are its resources of limestone and coal which are also very important in steel making?

You have said that the steel industry is made up of a number of companies. How many?

There are more than 200 companies in the industry, employing at the present time about 600,000 men and paying out over \$100,000,000 a month in payrolls.

Has there been any shortage of labor in steel mills?

Thus far there has been virtually no shortage of steel workers, largely because of the job training and apprentice training programs which have been regularly conducted by companies in the industry. Another reason is that hourly wages paid by the steel industry are the highest in the history of the industry and average almost 30 per cent higher than the average for all manufacturing industries.

BRIDGES TAKE PLACE OF HIGH EMBANKMENTS

Two-thirds of Heavy Rock Cut Wasted

By R. L. IDDINS

Resident Engineer
Tennessee Department of
Highways and Public Works

THIS job differs from most highway projects in three specific ways. First, the designers found economy in substituting additional bridge size, height and length, for haul and embankment construction; second, out of a 118 ft. rock through cut, 330 ft. long, two thirds of the excavation was wasted; and third, on one section the road, in embankment, ran along a mountain side, parallel to and above a railroad track and the old road, to which excavation was hauled 1200 ft. for a fill that was held in place by three concrete retaining walls. Engineers found that it was cheaper to build a deck truss and a deck girder bridge at the two main river crossings than it was to build embankments to grade with waterway structures in them of sufficient size to carry expected stream flow.

Relocation

Some of the most difficult construction undertaken by the Tennessee Department of Highways and Public Works was on this project which is a relocation of U. S. 19E, in East Tennessee. The project, which was completed in April, consisted of drainage, grading, and bridges on a section 1.879 miles long between Hampton and Valley Forge. It is shown by Figure 1. The old road followed the Doe River through a gap in the mountains. Comparatively heavy traffic consisting of heavy

freight hauling, bus lines, tourist traffic, and a large amount of local travel is carried by this road.

In making the location survey at the loop in Doe river, three possible routes were considered. One route followed an old railroad grade on the north side of Doe River around the loop. This proposed route had a maximum curvature of 20 degs., included three bridges, retaining walls, and heavy grading, and was the longest route considered. Another route considered was near the old highway. It required two river bridges on curves and heavy grading and had poor alignment. The third route cut across the loop in Doe River. Two river bridges were required with a rock cut of approximately 75,000 cu. yds. between the bridges. A saving of 2800 feet in distance, with better alignment, and at approximately the same construction cost resulted in the choice of this route. The relocation eliminated a railroad crossing at Valley Forge, and an underpass where the old highway ran under the railroad bridge across Doe River.

Bridges

Four bridges were included in the contract. Starting at Hampton, the east end of the project, bridge No. 1, see Figure 1, was a widening job on a five span structure, increasing the roadway width to 24 ft. Bridge No. 2 is a two span concrete deck girder structure. Bridge No. 3 is a six span concrete deck girder bridge 307 ft. long, on a 7 deg. curve. Bridge No. 4 is a continuous steel deck truss bridge 412 ft. long. The bridge quantities included 3427 cu. yds. of concrete, 366,000 lb. of structural steel in the steel deck truss, and 361,000 lb. of steel bar reinforcement. The total cost of the bridges was \$119,297.00.

Grading

The plan quantity of the grading was 227,098 cu. yds. of excavation of which about 60 percent of the material was rock. The excavation was bid at 40c per cu. yd., unclassified. The roadway width was 37 ft. shoulder to shoulder.

The construction of bridges No. 3 and No. 4 was coupled with the excavation of the rock cut between them. Part of the cut had to be moved before the bridges could be completed, and the last 25,000 cu. yds. of material had to be hauled over the completed bridges, for embankment construction. The cut was 330 ft. long, had a maximum depth of 118 ft., and a volume of 75,000 cu. yds. The rock in the upper part of the cut was loose and could be moved without difficulty. At lower depths seams of hard rock were encountered. The cut was planned for a $\frac{1}{4}$ to 1 slope, but on account of the loose rock it was changed to a $\frac{1}{2}$ to 1 slope. The location of the cut was adjoining a large basin which was used as a waste dump for about 50,000 cu. yds. of the mate-



Fig. 1.—Plan Showing General Location of New Road. Bridges 3 and 4 Were Cheaper Than Building Fills



Fig. 2.—In Foreground Bridge No. 3 Under Construction. In Background Power Shovel Loading Crawler Wagons Which Haul Material to Waste Dump Shown. Bulldozer Pushes Waste Overboard

rial. At the west end of the cut the old highway ran along the river and under bridge No. 4 making the grading work hazardous to traffic. When working on this end of the cut it was necessary to flag traffic to prevent injury by rolling rock. The contractor started work on the cut with a bulldozer by following an old trail to reach the top of the cut. Approximately 40 ft. of the cut was moved by bulldozers working the material into the waste dump. Later a $1\frac{1}{2}$ cu. yd. shovel and two 16 cu. yd. side dump crawler wagons were used on the longer hauls. The shovel was moved over a trail built along the hillside and across the waste dump to the cut. The waste dump provided a space for the equipment when blasting was being done.

Another difficult piece of construction was at a point where the new location ran along the mountain above the railroad and old state highway. This section was side hill work with about 25,000 cu. yds. of material to be moved, a large part of which was rock. This material had to be hauled about 1200 ft. for embankment construction. Three retaining walls were built on this section to hold the fills. The contractor started on the west end of the cut and worked out a haul road along the old railroad grade. Working from the end, with careful shooting and handling, he managed to move the cut with only a few hundred yards of material rolling down onto the railroad and highway. A bulldozer cleared the material from the railroad and from the highway working it down the hill where it was wasted along the river.

Two 12 cu. yd. scrapers were used to move the common excavation and to haul part of the capping material.



Fig. 3.—Touching Up Finished Bridge No. 3. View Taken Looking in Opposite Direction From Fig. 2



Fig. 4.—Completed Bridge No. 4 Looking Through 118 ft. Rock Cut. End of Bridge No. 3 Visible. Note How Bridges Nos. 3 and 4 Replace Embankment Construction. Railroad Emerges From Tunnel at Right

The rock drilling equipment was three compressors, one wagon drill, and four jackhammers.

The last section graded was from Hampton 3500 ft. west, where the location followed the old highway. One way traffic was maintained with some delay when blasting, and while clearing the road after shots.

The project was capped with a selected material from the west end of the job, and macadam stone was placed for a temporary surface.

The contract for the construction of the project was awarded to Foster and Creighton Company, of Nashville, Tennessee, at a total bid price of \$224,915.83. They built bridges, drainage structures, and retaining walls while B. G. Young, of Jonesboro, Tennessee, handled the grading.



Fig. 5.—Tops of Retaining Walls Visible in Foreground Where New Road Held in Place Above Railroad and Old Highway

Personnel

Mr. R. E. Luckado, was superintendent for Foster and Creighton Company, while Mr. B. G. Young and Mr. Louis Young, supervised the grading.

For the Tennessee Department of Highways and Public Works the project was under the supervision of Mr. W. T. Brooks, Division Engineer, Mr. J. B. Hawley, Division Construction Engineer, and Mr. R. L. Iddins, Resident Engineer.

\$22,436,000 Contract Let—A contract has been awarded to Panama Constructors, Inc., for excavation for the third set of locks at the Pacific end of the Panama Canal for \$22,436,086.

DATA ON CONSTRUCTION WITH A 34-E SINGLE DRUM PAVER

Observation on a State Project Near Chillicothe, Illinois

By C. G. SAVILLE

Resident Engineer
Illinois Division of Highways

ONE OF THE interesting jobs carried out by the Illinois Division of Highways in 1940 was the Federal Aid Project covering $7\frac{1}{2}$ miles of concrete surface construction on State Route 30, South of Chillicothe. Waukegan Construction Company, of Springfield, Ill., was contractor.

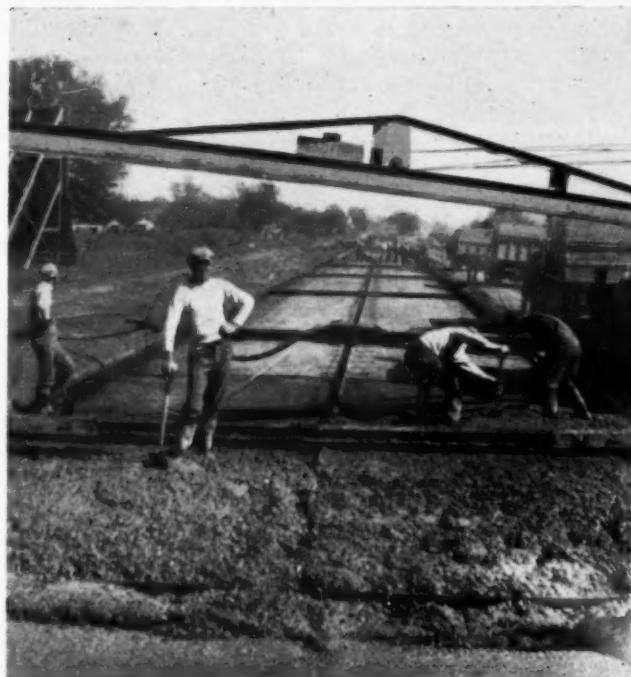
Most of the pavement was a 9-9-7-9-9 section, 22 ft. wide, with premoulded expansion joints at approximately 50-ft. intervals. Reinforcing fabric was used in accordance with state specifications.

Along most of the route the paver operated on one of the 10-ft. shoulders. Within the limits of the Village of Chillicothe, the pavement was 40 ft. wide, with returns at all intersecting streets. This portion was constructed in two 20-ft. slabs.

The paver was a Multi-Foote 34E Single Drum. An allowable 10 percent overload raised the maximum batch to 37.4 cu. ft. Net mixing time was 60 seconds. The total time required per batch under normal conditions was 73 seconds, but this time could vary, depending on the moisture content of the material.

The 35-ft. boom with which the paver was equipped was helpful in several ways. When placing the second 20-ft. slab of the 40-ft. pavement, the machine was operated on the subgrade; and the long boom was convenient in paving the street returns on the opposite side of the slab already placed. Also it permitted more space behind the paver for the placing of center steel and fabric joints.

The paver was equipped with a 16-ft. strike-off beam for pulling the strike-off necessary for the pavement fabric. The strike-off was connected to a special drum on the skip drive shaft by a cable through pulleys on the beam; and by this means the mixer operator could



The Long Boom, Strike-Off and Strike-Off Beam. Note How the Hose Is Carried by the 2x4 Extension on the Beam.

pull it forward without moving the paver, or vice-versa. The location and manner of use of the beam is shown in the first picture. A 2x4 plank was fastened to the beam as an extension to carry the water hose, and can be seen in both pictures.



A General View Showing Paver, Strike-Off, Strike-Off Beam, and One of the Three-Batch Trucks.

Material was delivered to the paver in 3-batch trucks. Regular paving bins were used, with Johnson scales. The hoppers were made larger to provide for the additional aggregate needed per batch. A Hertzel bulk cement plant was used, and the cement was weighed with a Krone scale. Work at the cement plant was handled by four men.

The concrete was vibrated along the longitudinal metal center joint, along both forms, and at the expansion joints, by a vibrator mounted on the finishing machine. The center joint was vibrated the first time the finishing machine moved forward. Then one side was vibrated as the machine backed up, and the second side during the final trip over the concrete. Joints were vibrated whenever completely covered with concrete.

The crew on paving operations was as follows:

Finishing foreman	1
Labor foreman	1
Mixer operator	1
Oiler	1
Concrete finishers	6
Vibrator operator	1
Setting center joint, dowel bars, and transverse joints.	4
Placing pavement fabric	2
Oiling forms and joint caps	1
Concrete puddlers	4
Handling concrete on finishing machine screed	2
Helping finishers	1
Placing and wetting burlap	2
Water boy	1

This crew handled the concrete, reinforcement, and expansion joints from the time they were received at the paver until preliminary curing was complete. The list does not include the labor for subgrade preparations; grading, removing, and setting forms; nor any of the labor necessary in delivering, transporting, or removing equipment or materials to the paver.

With continuous operation, 950 ft. of pavement was placed per 8-hour day. This amounts to 119 ft. per hour for the 22-ft. pavement, and would be equivalent to about 131 ft. per hour for 20-ft. pavement. On a theoretical basis, the paver should place 132 ft. per hour, but due to excess in thickness and other minor losses the maximum daily rate for this job was 119 ft. per hour.

The project was designed and the construction supervised by the Illinois Highway Department with Ernst Liebermen, Chief Engineer; C. M. Hathaway, Engineer of Construction; Theo. Plack, District Engineer; and C. G. Saville, Resident Engineer. Porter Clark was superintendent for the Waukegan Construction Co.

MANIPULATING KINK FOR TRACTOR SCRAPER OUTFIT

Keeping a tractor-scraper outfit off of a new concrete pavement while it was building a driveway brought up a method operation which may be of interest. The Bellefontaine Development Company of Bellefontaine, Ohio,



Fig. 1.—Loading Down the Driveway



Fig. 2.—Looping Back to Stay Off New Concrete

used 18-yd. scrapers to handle the earth near Pomeroy, Ohio. When these pictures were taken all of the heavy grading was done and the pavement laid. One scraper outfit was used on shoulder and for general cleanup work.



Fig. c.—On Shoulder Headed for Dump, Travelling in Direction Opposite to Loading

On this particular operation the Caterpillar-LeTourneau outfit is cutting a driveway in the bank. The drive was not planned until after the paving had been poured. Consequently, the dirt had to be hauled on the shoulder to the waste dump. The dump was where the outfit had to haul away from the driveway in a direction opposite from that which it used in loading.

Reference to the three pictures will show (1) Cutting and loading down grade on the driveway, (2) Looping back to head in opposite direction, and (3) On way to dump, off of the pavement. The contractor and operator were quite proud of this kink.

Correction

to LEAD OFF ARTICLE IN MAY ISSUE

An error occurred in the last sentence of the next to the last paragraph on page 40 of the May issue. The sentence as printed reads as follows: "This is particularly true of Orvus, Vinsol Resin and Calcium Chloride." The sentence should have read: "This is particularly true of Orvus, Vinsol Resin when treated with Calcium Chloride."

We request you make this correction to your copy in the article entitled "Extensive Research on Concrete Highway Project," by J. W. Kushing, Research Engineer, Michigan State Highway Department.

Hoffman Completes Heavy Grading Job

COMPLETION of one of Wisconsin's heaviest and most costly grading jobs was recorded late this spring when a power shovel pulled out of a 90 ft. rock cut in the wooded Coon Valley region. The project, 15 miles southeast of La Crosse on U. S. 14 and 61, although only two miles in length, included 144,815 cu. yds. of common excavation, 71,566 cu. yds. of rock, 111,366 cu. yds. of special compacted embankment, 63,369 sq. yds. of dirt for roadway preparation, and 6,243 cu. yds. of crushed stone surfacing. Grading cost almost \$35,000 a mile.

This job is a grade reduction project primarily over the old right-of-way, with curves removed. The top of



A 1½ Yd. Amsco Bucket on a P & H Power Shovel Uses Only a Quarter Swing in Loading Trucks in Rock Cut

the grades, each about a mile long, was the balance point. The new cross-section is 38 ft. shoulder-to-shoulder with wide ditches and gradual backslopes. A temporary wearing course of crushed rock has been applied.

Construction Details

Working from the hilltop balance point, the contractor used orthodox shovel-and-truck and tractor-scaper-bulldozer methods to move more than 400,000 cubic yards of earth in less than four months. Last September, Adolph Melrose, dirt foreman on the job for the Hoffman Construction Company of Black River Falls, Wis., started stripping and working in the dirt cuts with the 20-yd. scrapers while Eugene Menge, the rock foreman, went to work in the rock cuts with a crew of 12 drillers, followed by the shovel and trucks. Cuts and fills on the two-mile job were balanced. There were four cuts on the hillside job, two in rock and two in dirt, with the deepest a 90-ft. cut in solid rock. The longest fill extended over 750 ft. and required 135,000 cu. yds. of compacted fill and special embankment. Drillers worked in two shifts of 6 hours each. Before winter forced a shut-down an easier grade had been roughed out.

Work was resumed on the job this spring with two six-hour shifts. The average scraper haul was about one-half mile. Rock went into the lower part of the embankments. At the peak about 65 men were employed. No camp was maintained.

One of the important units on the project was the service and repair truck outfit which checked and greased the equipment between each shift. The repair



Two of the Three Tractor and Scraper Units in Action. Trucks Hauling from the Rock Cuts Operated Over the Same Fill

wagon included an arc welder and a complete assortment of maintenance tools for necessary repairs. The Hoffman Construction Co. long ago discovered that proper care of construction equipment not only lengthens its productive life, but increases individual job profit by assuring continuity of operation. Each piece of equipment is completely serviced and checked before being placed in operation on a construction job. The diesel engines in all equipment, with the single exception of trucks, are checked regularly, the tractor treads are examined and replaced when necessary. Dipper teeth are prepared for heavy rock work with a special hardening alloy.

On all their jobs, and especially in heavy dirt and rock work, the Hoffman Construction Company has found it essential to equip their machines with a safe, dependable wire rope. Preformed wire rope is standard on all Hoffman shovels and scrapers. They have learned of the economy of those preformed wire ropes which constitute the sinews of the shovel, or the muscles of the scrapers, flexing and tensing throughout the work day.

Equipment Used.—Following is a list of the principal units of equipment:

- 1 P. & H. power shovel with 1½ yd. Amsco dipper.
- 6 Ingersoll-Rand compressors.
- 6 Thor jackhammers.
- 3 Caterpillar D8 crawler tractors.
- 3 LeTourneau 20 yd. scrapers.
- 1 Caterpillar No. 12 motor grader.
- Wire rope—all preformed.
- 14 Trucks.
- 1 Service truck for greasing and repairing, which included an arc welder.



Caterpillar Motor Grader Smoothed Back Slopes, Cleaned Ditches, and Kept Construction Road Smooth

TEXAS IMPROVES TRAFFIC STRIPE

Development of a new type of asphalt and stone center traffic stripe by the Texas Highway Department is bringing about a much better traffic dividing line on state highways and promises a considerable saving in the cost of this important traffic safety feature in Texas. Besides being non-skid its visibility is much greater, both in dry and wet weather, day or night, and it shows more distinctly for long distances. It is non-glaring, either in bright sun light or in the light from headlights of approaching cars. It is semi-permanent and will greatly outwear the usual painted or plain asphalt stripe. On asphalt, seal coat and other types of paving it will last virtually as long as does the pavement itself. It is made by spreading and rolling small stone into an asphalt stripe.

The new stripe is built up, being about one-fourth of an inch thick. It can always be made to contrast with



Visible Clear Into the Distance Is This New Stripe on S.H. 29 in Gonzales County, Texas

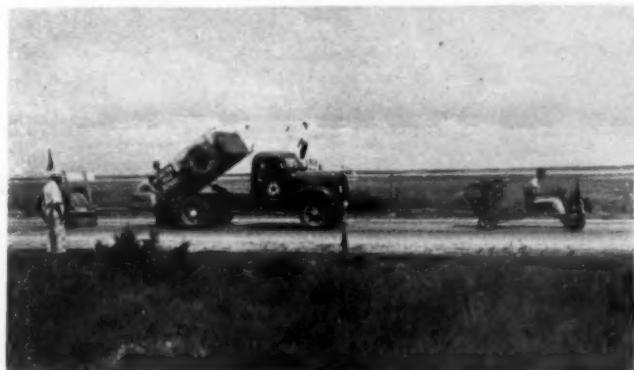


Stripe Remains Clearly Visible on Wet Highway During Rain. Picture Taken on S. H. 96 in Gonzales County of Black Center Line

the pavement in color and elevation. On concrete and grey asphalt pavements small black stone is spread into the asphalt stripe and on a black or dark surfaced pavement white rock is used. The new stripe is even less expensive than a painted stripe, which costs about \$15 per mile at the minimum while the semi-permanent asphalt and stone stripe costs about \$14 a mile.

Because of its greater visibility and also since it can be felt slightly when the front tires touch it, the new stripe does a much better job of keeping traffic separated and on the right side of the road and therefore should reduce collisions. Another advantage of the new stripe is that cars may run over it almost as soon as it is put

down without smearing it. No small warning flags need to be placed along the stripe to keep traffic off of it, with the exception of on sharp curves or turns where traffic is especially heavy. Even then only a few hours



Striping Outfit in Operation Near Corpus Christi, Texas. The Aggregate Truck Provides Motive Power for the Entire Outfit

are needed until the asphalt has hardened sufficiently to hold the small stone rolled into it.

District No. 16 of the Texas Highway Department, headquarters of which are at Corpus Christi in charge of District Engineer George B. Finley, has striped most of the highways in the district with the new stripe and designed and built an outfit for laying it. This consists of a small four wheeled chassis on which is mounted a large tank and pump for spraying the asphalt stripe, a regular highway department maintenance dump truck carrying the small stone, a spreader and a roller to press the stone into the stripe. The truck pushes the striper and the small stone flows from the elevated dump body of the truck into the spreader immediately back of the truck and in front of the roller. The truck pulls both the spreader and the roller besides pushing the striper. The outfit can efficiently lay the completed stripe at four miles per hour. One machine can handle the work of four or more districts.

FOURTH PAN-AMERICAN HIGHWAY CONGRESS

The Fourth Pan-American Highway Congress will be held in Mexico City on September 15 to 24, 1941. It will be held at the same time as the Travel Congress. A road machinery exposition is planned to be held simultaneously with these events. Further information about the road congress or machinery exposition may be obtained from Sr. Armando Santacruz, Jr., assistant secretary, Edificio de la Secretaria de Comunicaciones y Obras Publicas, Mexico, D. F.

Following is the agenda of the highway congress:

SECTION I.—HIGHWAY ENGINEERING

1. PLANNING A HIGHWAY SYSTEM.

- A. Preliminary Survey.—Classification of existing highway routes. Coordination with other communication systems.
- B. General Construction Program.—Priority of routes:
a) Traffic service. b) Land and industrial development.
c) Defense.
- C. Principles of Highway Location.—Aerial surveys. Location. Mapping. Right-of-way. Structure design. Estimates of costs.

2. CONSTRUCTION AND MAINTENANCE.

- A. Specifications.
- B. Research. Soil-mechanics. Laboratories.
- C. Hand and machine grading operations.

- D. Sub-grade drainage. Surface drainage: culverts, temporary bridges, permanent bridges.
- E. Stabilization processes: subgrades, bases and surfaces.
- F. Surface construction.—Soil. Surfacing with selected materials. Untreated gravel or stone. Flexible type pavements. Rigid type pavements.
- G. Highway Safety.—Safety fences. Elimination of grade crossings. Illumination of main highways.
- H. Maintenance Procedures.—Roadside banks, shoulders, drainage. Flexible and rigid types pavements.
- I. Right of way development. Roadside development. Commercial advertising.
- J. Roadside services: Emergency Mechanical Stations. First-aid Stations. Telephone and Telegraph Booths, Filling Stations, Hotels and Courts, Information Offices. Location and Architectural design of above.

SECTION II.—FINANCE AND MANAGEMENT

1. FINANCE AND ECONOMICS.

- A. Source of Funds for Highway Construction and Maintenance. Motor vehicle revenue. Fuel taxes. Increased property values taxes. Tolls. Other taxes.
- B. Federal bonds, local bonds. Bond-issuing organizations.
- C. Uniform highway accounting.
- D. Diversion of highway funds.
- E. Economic aspects of highway transportation: National, International.

2. MANAGEMENT.

- A. Organization and Coordination of Central and Local Highway Offices. Independent organizations.
- B. Relation with other Government Agencies.
- C. Cooperation with Public and Civic Organizations.

SECTION III.—OPERATION AND SAFE USE OF HIGHWAYS

1. LEGISLATION AND SAFETY.

- A. Legislation.—Uniform Vehicle Codes. Drivers' Licenses. Rules of the Road. Vehicle Registration. Traffic Ordinance for Cities. Uniform Signs, Signals and Markers.
- B. Administration of Vehicle Laws. Traffic Engineering. Examination of New Drivers. Uniform Accident Reporting. Inspection of Vehicles. Studies of Causes of Accidents.
- C. Enforcement.—Highway Patrols. Enforcement in Urban Areas. Enforcement in Rural Areas. Traffic Courts. Revocation of Licenses.
- D. Regulation of International Traffic.
- E. Survey of Future Development in Traffic Regulation.

2. EDUCATION AND APPROACHMENT.

- A. Teaching Safety in the Schools.
- B. College courses on Highway Engineering, Transit, Safety and Economics.
- C. Public Safety Organizations and Campaigns.
- D. Exchange of Professors, Engineers and Students.

SECTION IV.—INTERNATIONAL MATTERS

- A. Permanent Organization of Pan-American Road Congresses: a) Report of the Executive Committee; c) Program for 1941-1942.
- B. Location of Pan-American Highway Route: a) Statement of Delegations and agreements on connecting points at International Borders; b) Progress in the construction of the Pan-American Highway.
- C. Financing of the Pan-American Highway. Inter-American Credit Institutions.
- D. Extension of Pan-American Highway System to Insular Republics.
- E. Operation under the Pan-American Convention of 1936: a) Finance Committee; b) Technical Committee.
- F. Development of Inter-American Highway System.—Reports from the Delegation of each country on the present Status of Construction and program for future activities.
- G. Conventions on the regulation of international traffic and special signs and markers.
- H. Inter-American Federation of Automobile Clubs.—Automobile clubs' cooperations on the development of International traffic.
- I. Glossary of road and bridge terms.

Gasoline Consumption Increased 6.2 Per Cent.—Gasoline taxed by the states in 1940 amounted to over 22 billion gallons, an increase of consumption over 1939 of 6.2 percent.

MALCOLM BURTON JOINS STAFF OF ROADS AND STREETS

Upon the discontinuance of publication of the *Earth-mover* and *Roadbuilder*, Malcolm V. Burton joined the staff of ROADS AND STREETS. Mr. Burton studied chemical engineering at the University of Illinois. After service in the U. S. Navy during World War I, his business career began in the shops of the All-Steel-Equipment Company of Aurora, Ill., where he rose to the position of foreman before being sent into the field to service equipment and later in sales work. In 1926 he entered the service of the Western Wheeled Scraper Co. in the



Malcolm V. Burton

advertising department and on the retirement of his father took over the latter's duties as editor of *Earth-mover*, which at that time was the house organ of the Western Wheeled Scraper Co.

Following the consolidation of Western Wheeled Scraper Co. and The Austin-Western Road Machinery Co. in 1932 *Earthmover* continued as the house organ of the company with Mr. Burton as editor.

Late in 1937 Mr. Burton purchased *Earthmover* from its previous owners and established it as an independent trade publication which he continued to edit until its discontinuance with the May, 1941, issue.

Mr. Burton requests his many friends to address him at ROADS AND STREETS.

Gas and Motor Vehicle Taxes Totaled Over \$1,300,000,000.—The states collected \$1,309,868,000 in 1940 from the gasoline tax and motor vehicle registration fees. Of this total \$870,690,000 came from the gasoline tax.

WASHO CONVENES AT CASPER, WYOMING

According to C. F. Seifried, program chairman for the 20th annual convention of the Western Association of State Highway Officials, which will be held June 17, 18, 19 and 20 at Casper Wyoming, plans for the convention are complete.

Among the many problems of vital importance to highway engineers and the general public to be discussed at this meeting are:

1. "Financing of National Defense Highways"—By Robert Lee Bobbitt, Member of the Texas Highway Commission.
2. "Keeping Highway Safety Within the Departments"—By Bernard C. Hartung, Assistant Maintenance Engineer, Nevada State Highway Department.
3. "Highway Taxes and the Necessity for Planning"—By J. E. Furlong, State Manager of Colorado Highway Planning Survey, and Aaron Abelard, State Manager of New Mexico Highway Planning Survey.
4. "Regulation of Sizes and Weights of Motor Vehicles"—By R. H. Baldock, Chief Engineer of the Oregon Highway Department; D. C. Greer, State Highway Engineer of Texas; and John L. Simmons, Manager of the Wyoming Highway Planning Survey.
5. "The Highway Contractor and His Future"—By M. W. Watson, President of the General Contractors of America.

Other topics of interest scheduled for presentation are: "The Present Legislative Situation in Washington, D. C.", "Practical Application of the Theory of Soil Compaction in Roadway Embankments," "Chemical Reactions of Cement on Aggregates and Concrete Structures," "Right-of-Way Standards and Requirements."

H. G. Sours of Columbus, Ohio, President of the American Road Builders Association, and W. C. Markham, Executive Secretary of the American Association of State Highway Officials, Washington, D. C., will speak on subjects, to be announced later.

The Bridge Committee of the Association will meet in session to discuss the 1941 Bridge Design Specifications of the American Association of State Highway Officials. They will also elect a new chairman of the Bridge Committee to fill the vacancy created by the resignation of Chairman Maurice Housecroft of the Utah Highway Department, who recently accepted an army commission.

The Townsend Hotel has been chosen official headquarters for the convention and all meetings will be held in the Council Chamber of Casper's new Court House. Ample hotel accommodations will be available at the Henning, Gladstone and Townsend hotels.

The Western Association of State Highway Officials is comprised of Highway Commissioners, Highway officials and local representatives of the U. S. Public Roads Administration in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, Wyoming, Hawaii and Alaska. Officers of the Association are: Burton G. Dwyer, State Highway Engineer of New Mexico, president; C. F.



*C. F. Seifried,
Chief Engineer,
Wyoming State
Highway Depart-
ment, is Program
Committee Chmn.*

Seifried, Chief Engineer of the Wyoming Highway Department, vice-president; C. P. Humphrey of Boise, Idaho, secretary-treasurer. Frank Kelso, Superintendent of the Wyoming Highway Department is the convention host.

The Program Committee is composed of: C. F. Seifried, chairman; Dr. L. I. Hewes, chief, Western Region of the Public Roads Administration, San Francisco; and W. R. Hutchins, State Highway Engineer of Arizona. John L. Simmons, manager, Wyoming Highway Planning Survey is in charge of registrations. A. B. Nuss, of Cheyenne is chairman of the Ways and Means Committee. J. Roland Carr of the Wyoming Bridge Department is publicity chairman. R. J. Temperton, division engineer and W. B. Schilling, resident engineer of Wyoming Highway Department are assisting with the arrangements.

PAN-AMERICAN SCHOLARSHIP AVAILABLE

Available now is a scholarship of the Pan-American Division of the American Road Builders' Association. This scholarship is available to a young man who is a graduate engineer from a highway engineering course of an accredited college or university and who has had from three to five years of actual field experience in highway engineering or construction. If you are interested please write a letter of application for the scholarship to Mr. V. J. Brown, Publishing Director, ROADS AND STREETS, 330 So. Wells St., Chicago, Ill.

There are other regulations and requirements that must be met. The applicant should be able to speak Spanish. He must get a leave of absence from his employer on part pay. The Mexican Government will provide 400 pesos per month. The applicant must be unmarried. The scholarship is for a three month period. The accepted applicant will have his transportation gratis from the border at Laredo, Texas, to Mexico City and return to Laredo.

And, he must have some funds of his own on which to draw.

If you are interested send your letter of application to Mr. Brown as indicated above.

OPEN LETTER TO GOVERNOR BOTTOLFSEN

*Governor C. A. Bottolfsen,
Capitol Building,
Boise, Idaho.*

Dear Governor Bottolfsen:

In the November, 1940, issue of ROADS AND STREETS a letter was published in which your secretary stated that you would bring the matter of a raise in salary schedules for the Idaho Bureau of Highways before the Legislature which convened in January.

To date nothing has been done in the way of an increase in salaries for highway department employees.

Have you presented the request for salary increases as you said you would do? If not, when do you propose to make the request?

Very truly yours,
V. J. BROWN,
Publishing Director.

TOP-NOTCH PERFORMANCE



ROCK-BOTTOM ECONOMY

Up with dependability—stamina—and long life. *Down* with operating costs—lay-up time—and repairs. These two superlative achievements have earned for Mack an unequalled reputation among profit-wise business men. There's a model for every hauling need—from the 1 ton Light Mack to the sensational 45 tonner for strip mining. Gasoline or diesel power. Mack Trucks, Inc., New York, N. Y.

THE MOST COMPLETE LINE OF TRUCKS IN THE WORLD—1 TO 45 TONS AND ALL "HEAVY DUTY"

The Cedarapids MOROK

The New Super-Quarry Crushing Plant



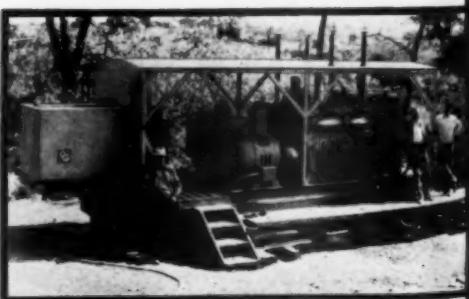
* MEETS THE DEMAND FOR BIGGER CARS
EASY PORTABILITY... LOWER PRODUCTION

The Cedarapids "Morok", the only plant of its kind in the industry today, meets the demand for big tonnage at low cost. Large construction projects requiring thousands of tons of aggregate must have material without delay. In one operation, from quarried rock to delivery trucks, the Cedarapids "Morok" delivers crushed, screened and graded aggregate at from 150 to 200 tons per hour.

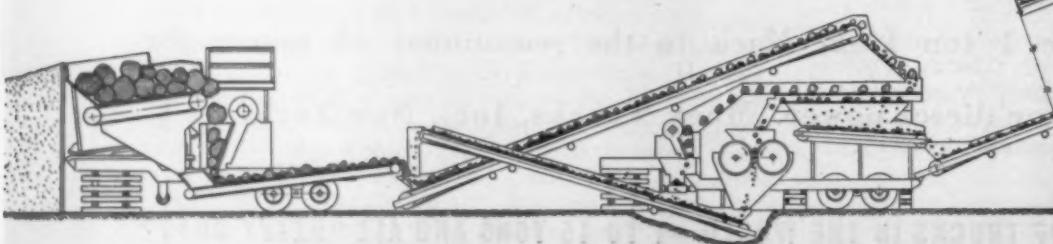
The Cedarapids "Morok" is completely portable. Each unit is mounted on its own tractor-trailer ready to be pulled to the job. Setting-up and dismantling time is reduced to the minimum.

Your Only Competitor Is Another "Morok" Owner!

ALL ELECTRIC POWERED



From Quarried Rock to Delivery Trucks
... IN ONE OPERATION



IOWA MANUFACTURING COMPANY

**AR CITY...
CTION COST
R POWER**

The Cedarapids "Morok" may be powered by separate electric motors for each crusher screen and conveyor. Electric power may be provided by special generator or from regular lines. Switches may be mounted on one panel for centralized control.

OR DIESEL PLUS ELECTRIC

An alternate power set-up is a combination of separate diesel motors for the primary crusher and the secondary crushers with electric motors for screens and conveyors. A small generator furnishes electricity for these motors.



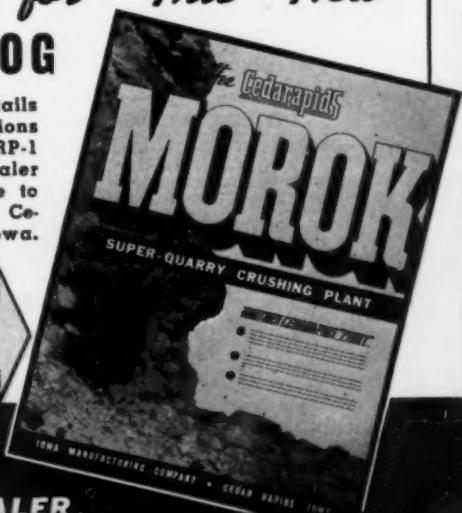
YOU CAN TAKE IT WITH YOU

When You Own a
Cedarapids MOROK



**Send for This New
CATALOG**

For further details and specifications get bulletin SRP-1 from your dealer today or write to Iowa Mfg. Co., Cedar Rapids, Iowa.



SEE YOUR

CEDARAPIDS DEALER

Cedar Rapids, Iowa . .

ADVERTISING PAGES REMOVED

PRESIDENT ROOSEVELT'S DEFENSE HIGHWAY MESSAGE

TO THE CONGRESS OF THE UNITED STATES:

Anticipating that the development of the national-defense program would have some effect upon the highway system of the country, I requested the Administrator of the Federal Works Agency nearly a year ago to make a survey of our highway facilities from the viewpoint of national defense and to advise me as to any steps that appeared necessary, particularly with respect to the adequacy of ingress to and egress from urban centers, the servicing of existing and proposed army, naval and air bases and the possible necessity for the strengthening of bridges and the widening of roads in strategic areas. This survey has been completed and a report has been submitted to me indicating the need for additional funds to aid in relieving traffic congestion in numerous areas.

The survey, at the time of its completion, indicated that there were 204 areas in which access roads and highway bridges in military, naval and industrial areas were of the utmost importance. It is estimated that the cost of providing this type of facility in the 204 areas will aggregate \$177,600,000, and will involve 2,594 miles of highways. Means have been found for financing the construction of about 1,090 miles at a cost of \$54,400,000, leaving 1,504 miles of the original program costing \$123,200,000 to be financed. It is estimated that 100 additional areas have become involved and that the overall cost of providing these facilities will now reach a figure of \$350,000,000. The work thus far provided for has been financed by the Work Projects Administration, by Federal-aid highway funds and by contributions of counties or states. It is my hope that readjustments in highway programs now authorized may release additional funds for meeting in part these new requirements.

It was believed that the amount recommended by me for community facilities would cover many of the more urgently needed access roads. The increase in the number of areas involved will now prevent the use of any considerable portion of that amount for highway improvements. It is clearly evident that the financial requirements for community facilities and access roads are greatly in excess of local resources and present available Federal funds and that additional funds will be required immediately to relieve the existing traffic congestion in important areas. In many instances it may be necessary for the Federal Government to bear the entire expense of providing these facilities, but local participation should be encouraged to the fullest possible extent. I recommend that \$100,000,000 be authorized specifically for assisting in the development of access roads.

It has been estimated by the Federal Works Agency that \$458,000,000 will be required as a minimum for strengthening the entire strategic network of highways of more than 75,000 miles. It is my belief that no necessity exists for undertaking such an extensive program now. Some progress is being made in this work under the normal highway program. There is a need, however, for giving immediate attention to strengthening bridges in key areas where existing structures are inadequate to accommodate rolling equipment of the Army. It may also be necessary to give some consideration to the widening of the surface of some highways in these key areas. Much of this work should be accomplished within presently authorized funds, but in some areas obligations already incurred will not permit the diversion of funds to these more important needs. I recommend the authorization of an additional \$25,000,000 to strengthen bridges and widen surfaces in key areas.

Any appropriation made for access roads should be available for use only in areas certified by the War or Navy Departments or the Office for Emergency Management. No attempt should be made to apportion funds for access roads in the manner in which funds are apportioned under the Federal Highway Act. All plans for highways should be coordinated insofar as practicable with state planning agencies. Concerning the improvements within key military areas, the authorizing legislation should provide for matching in the same manner now followed with respect to Federal-aid highway construction and provision should be made for the determination of the needs through certification thereof by the War or Navy Departments, or the Office for Emergency Management, and without regard to the usual apportionment formula.

The Federal Works Administrator will soon submit to the Congress a draft of a bill authorizing appropriations for the purposes herein indicated and it is hoped that this matter may have early consideration.

(Signed) FRANKLIN D. ROOSEVELT.

The White House,
June 2, 1941.

RESEARCH ON SOIL-AGGREGATE MIXTURE

A research project, now under way at the Michigan State College, seeks to improve the serviceability of soil-aggregate mixtures as road bases and surfaces. Operating under a fellowship sponsored by the Calcium Chloride Association, the program is being conducted by the Division of Engineering of Michigan State College in collaboration with the Research Division of the Michigan State Highway Department.

Investigations are being performed on a circular test track with equipment designed to simulate the action of traffic. Differing proportions of soil-aggregate mixtures are placed in the track, then subjected to thousands of trips by a pneumatic-tired treadometer weighted to 800 lb. Plasticity indices of the sections are varied, and part of each section receives calcium chloride treatment (either as an admixture or by surface application) while others are left untreated. Comparative studies are then being made on rates of compaction, densities attained, amounts of surface disintegration, effects of subgrade and surface water, etc.

The Michigan program of tests will study the behavior of stabilized soil-aggregates as a wearing course under wet and dry conditions and the control and treatment of consolidated gravel surfaces under calcium chloride maintenance.

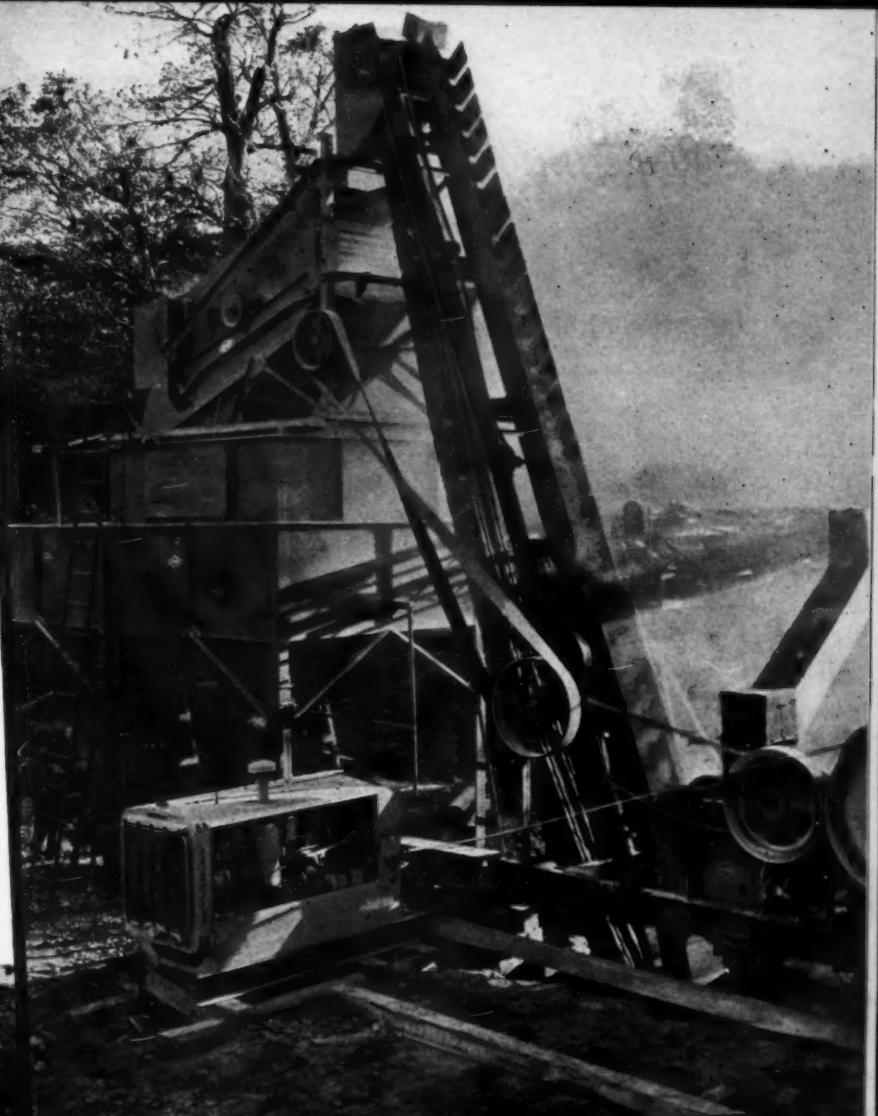
It is planned to coordinate this work with service behavior and economics studies being conducted by the maintenance division of the Michigan State Highway Department.

AMERICAN INDUSTRY SPENDS \$300,000,000 PER YEAR FOR RESEARCH

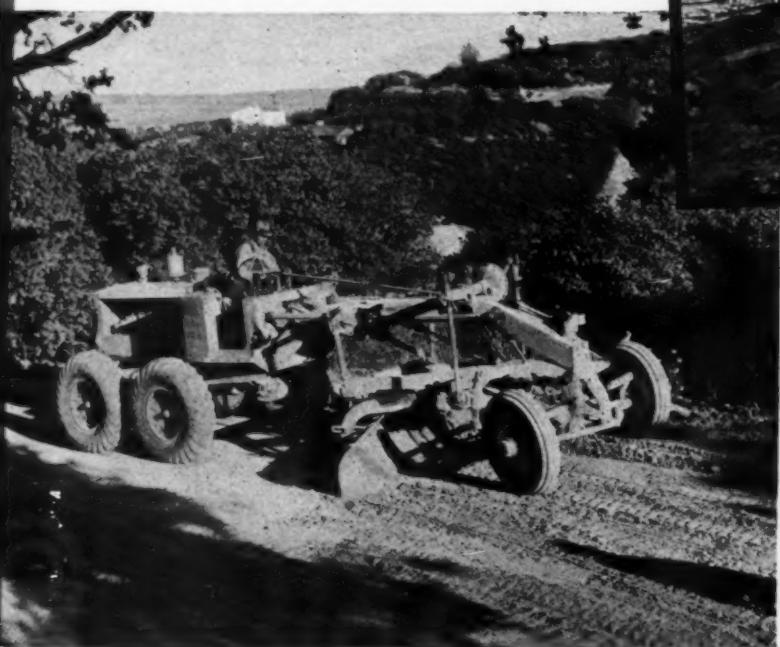
American industry spends 6 per cent of its net income on industrial research and has increased its research personnel 41 per cent in the last two years according to a report on industrial research by the National Research Council and the National Resources Planning Board which has been transmitted to Congress by President Roosevelt. These conclusions are drawn from an extensive survey conducted by the National Research Council in which 2,350 companies reported 70,033 persons engaged in technical research in American industry at an average annual cost of \$300,000,000.



"Caterpillar" Diesel Engines are available in sizes from 34 to 190 maximum horsepower.



"Caterpillar" Diesel Motor Graders are available in three sizes.



"Caterpillar" Diesel Tractors are available in sizes from 25 to 113 drawbar horsepower.



CATERPILLAR DIESEL

U.S. PAT. OFF.
ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

Equipment and Plant Setup for Producing Aggregate For 22-Mile Kansas Bituminous Job

On Kansas Route 96 near Fall River, the Inland Construction Company of Omaha, Nebr., with some unusual difficulties, partially completed a 22 mile bituminous surfacing job from one plant setup. The unusual difficulties are of no particular importance to this report except that the auxiliary crusher shown in the foreground of the picture of the bins had to be used to meet a changed specification.

The feature of this report is that the contractor put together the equipment of so many different manufacturers and obtained the output necessary to complete the job. Following is a list of the equipment employed:

Bins—Iowa Manufacturing Company

Primary and Secondary Hammer Mill Crushers—

Gruendler Crusher and Pulverizer Company

Elevators—Austin-Western Road Machinery Company

Feeder—Pioneer Engineering Works

Conveyor—Diamond Iron Works

Power—Caterpillar Tractor Co.

Bin and Conveyor, Auxiliary—Kennedy Manufacturing Company

Trailers (10)—Insley Manufacturing Company

Power Shovel (2 yd.)—Northwest Engineering Company

Dumptors (2)—Koehring Company

Tractor—Caterpillar Tractor Company

Bulldozer—R. G. LeTourneau, Inc.

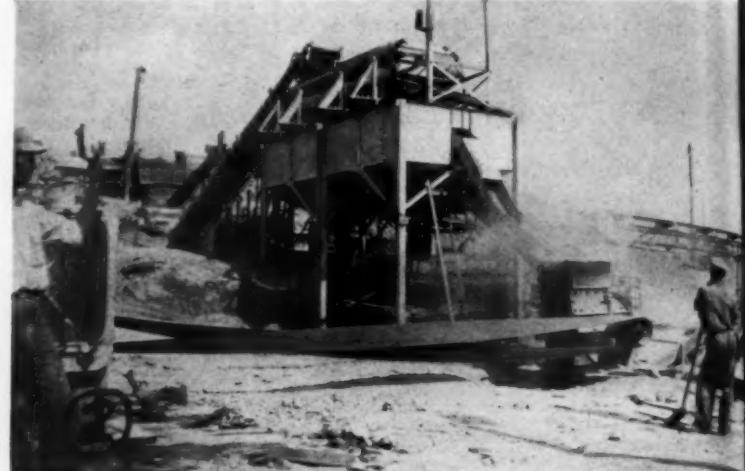


Figure 1 shows a dump truck unloading from the pit face onto the bar screen, from which the rock travels to the primary crusher.

Figure 2 shows the plant setup. The small hammer mill in the foreground was added to the outfit later when a changed specification was introduced. Oversize from the first plant is routed through this crusher from which the output is stored in the added set of bins shown in figure 3. Trailers can be seen under the hoppers on which vibrating screens are mounted.

Figure 3 shows a distant view of the plant setup and in the foreground some of the hauling trailers. The bins shown to the right are the added units to hold the output of the secondary crusher.

Figure 4 is a good picture of the hauling units used between the plant and the site of the road work. The big grill work placed in front of the radiator of the truck is a stout pipe grill work used for pushing each other out of soft spots they got into. The weather was quite wet a great deal of the time.

ADD THE Strength THAT WILL LAST A LIFETIME!



THE added strength of a backbone of steel protects the life of many of the nation's leading highways. U-S-S WIRE FABRIC has been chosen time and time again for this job because of its outstanding quality and fundamental design. U-S-S WIRE FABRIC is made of high-yield-point cold drawn steel, and the wires are closely spaced to

provide uniform stress distribution.

U-S-S WIRE FABRIC is available in sheets or rolls to suit your requirements. Installation is simple and easy. Write us for further information or for the assistance of our engineers. They'll help you in applying the protective features of U-S-S WIRE FABRIC to your next highway job—without obligation.



**WIRE
FABRIC**

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, Pacific Coast Distributors

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UNITED STATES STEEL

HOW IS YOUR NEXT Paving Job GOING TO LOOK?

Like THIS?

YOU can see the profits slipping through your fingers on a job where the finegrading is done by hand if you compare it with the job done by an R-B Power Finegrader!

Visualize slow, costly, inaccurate hand finegrading — men swarming all over the grade building up the low spots, leveling off the high ones — holding up the paver and crew and trucks — leaving an inaccurate grade that costs you either excess aggregate for a slab that's too thick or penalties for a slab that's too thin.

True — you may not get into a jam like the one illustrated but *it has happened* — and with the speed and output of the new pavers it's more likely to happen than ever before.

Compare this with the speed, accuracy and low cost of R-B Power Finegrading. R-B Power Finegraders eliminate the bottleneck on otherwise completely mechanized jobs—in one pass they wipe out all the excess labor, delay and trial and error methods — they cut a grade that's right on the *payline*, accurate and even all the way — they reduce loss of aggregate, reduce your labor costs, keep the grade way out ahead of the paver and MAKE BIGGER PROFITS POSSIBLE!

R-B Power Finegraders are built to meet any conditions — sand, clay or stony soil — curves and hills — banks and crowns — and there's a size for any job from 8 ft. to 24 ft. wide!

Buy R-B Power Finegraders for fewer headaches and bigger profits this year. Write for literature today.

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POWER
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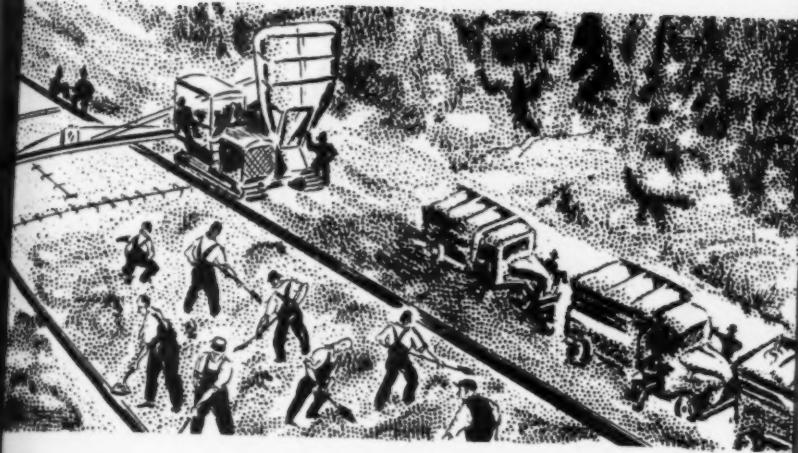


LESS TIME
NEEDED FOR
ROUGH GRADING!

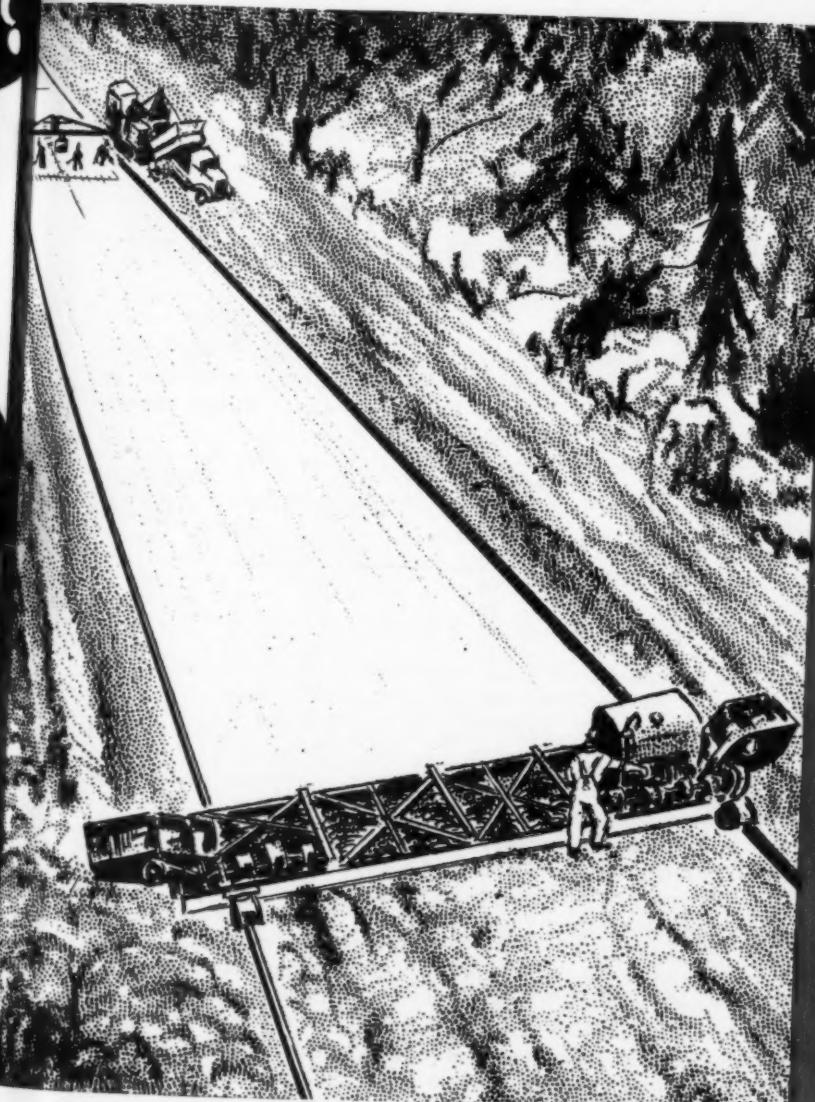
These pictures illustrate how little effort is required for preparing subgrade. Leave it ROUGH! The R-B Finegrader will cut it to specifications!



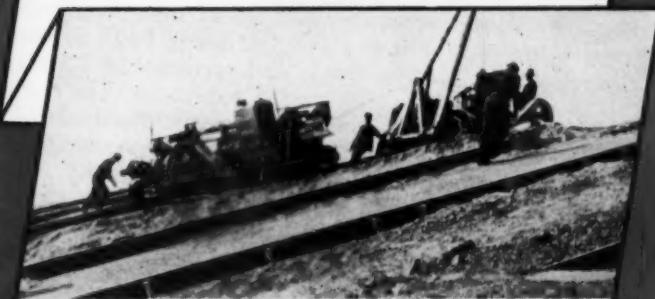
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See other cost cutting
Buckeye equipment on page 6

Convertible Shovels



Trenchers



Tractor Equipment



R-B Finegraders



Road Wideners



Spreaders



POWER SHOVELS AND CRANES

Commercial Standard for Crawler Mounted Revolving Power Shovels, Lifting Cranes, and Dragline and Clamshell Excavators (Export Classifications)

ON DEC. 14, 1939, a conference of representative manufacturers, held in Chicago, Ill., indicated its interest in the establishment of a commercial standard for exports of power shovels and cranes. The conference reviewed a tentative draft which had been prepared by the National Bureau of Standards, and requested that it be redrafted along the lines of classifications rather than definite specifications.

Accordingly, a revised draft was prepared and submitted to interested manufacturers for comment. The Bureau of Foreign and Domestic Commerce cooperated in obtaining comment on this draft from Latin-American countries and from Canada, which was placed before the American manufacturers and which indicated that such a standard would be very helpful in bringing about better understandings between buyers and sellers.

A subsequent conference of representative manufacturers held in Chicago on June 6, 1940, adjusted the revised draft in detail, and recommended its circulation to the industry for written acceptance. The recommended commercial standard was accordingly circulated for written acceptance on June 18, and upon receipt of written acceptances by a satisfactory majority, Commercial Standard CS90E-41 was promulgated in mimeographed form on Nov. 9, 1940, to be effective for new orders from Jan. 9, 1941. The standard is reprinted below practically in full.

Purpose

1. The purpose of this commercial standard is to set up definitions and requirements for fair competition and a better understanding between buyers and sellers of crawler mounted, revolving power shovels, lifting cranes, and dragline and clamshell excavators in export from the United States of America, and to provide a uniform basis for compliance through the use of labels or certificates.

Scope

2. This standard provides nomenclature, definitions, and requirements for crawler mounted, revolving power shovels, lifting cranes, and dragline and clamshell excavators. It covers shovel dipper capacities ranging from $\frac{3}{8}$ to $2\frac{1}{2}$ cu. yd., and crane sizes from $2\frac{1}{2}$ to 50 tons. It sets up uniform methods of taking dimensions and determining working ranges, power, line speeds, line pulls, crane sizes, and lifting capacities which are to be furnished for comparison of models offered by manufacturers for export from the United States of America. It also covers a uniform method of labeling or certifying compliance with the standard.

Nomenclature and Definitions

3. *Boom angle.*—The boom angle is the angle between the horizontal and a straight line drawn between the center of the boom socket or boom foot pin and the center of the boom point main hoist sheave pin.

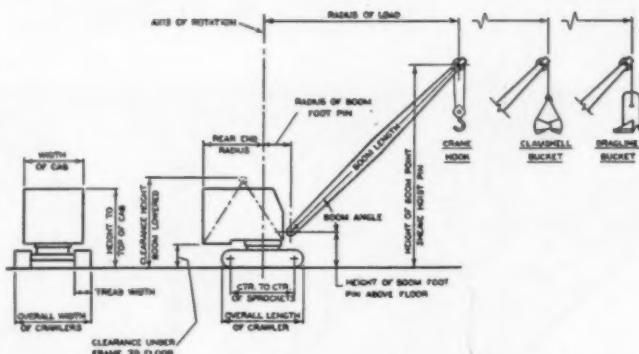


Fig. 1.—Lifting Crane, Clamshell and Dragline Excavators

4. *Boom—Base rating length.*—The base rating length of lifting booms on machines for lifting loads are as follows for machines having nominal shovel dipper capacities as indicated.

Shovel Dipper Capacity Cubic Yards	Base Rating Length of Boom ¹ Feet	Shovel Dipper Capacity Cubic Yards	Base Rating Length of Boom ¹ Feet
$\frac{3}{8}$	25	$1\frac{1}{4}$	45
$\frac{1}{2}$	30	$1\frac{1}{2}$	45
$\frac{3}{4}$	35	2	50
1	40	$2\frac{1}{2}$	60

¹ Other lengths are available over a wide range.

5. *Boom length.*—The length of the boom is the straight-line distance in feet from the center of the boom foot pin to the center of the boom point main hoist sheave pin.

6. *Crawler bearing length.*—The length of the crawler bearing on the ground is computed as not more than the normal distance from center to center of the crawler end sprocket or tumbler wheels, plus 35 per cent of the over-all crawler height at center of end sprocket or tumbler wheels. (This takes into account the bearing of about one additional pitch of the crawler shoes.)

7. *Governed engine speed.*—The governed engine speed is that speed at which the engine operates to develop full-load torque for that particular governor setting.

8. *Handled.*—The term "handled" shall comprise the lifting and swinging of rated loads through maximum arc of swing with the machine resting upon a firm, level, supporting surface.

9. *Least stable position.*—In determining the least stable position, the load shall be lifted with the machine resting upon a firm, level supporting surface, and the machine with the load tied to the boom foot to prevent outward swing on rotation. The least stable position is the position of the boom in rotation which provides the minimum of stability. (Generally with the boom at right angles to the crawlers.)



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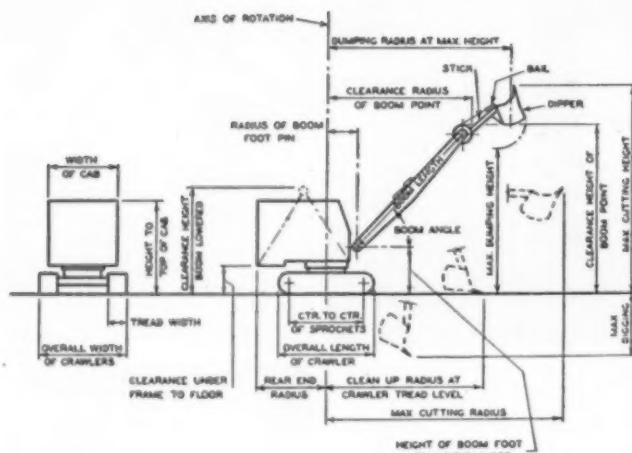


Fig. 2.—Shovel Dimensions and Working Ranges

10. *Line pull.*—The single line pull is the maximum pull in pounds at the drum, based on full-load torque at governed engine speed.

11. *Line speed.*—The line hoist speed is the speed in feet per minute of a single line based on the governed engine speed.

12. *Bail.*—The bail is a member which is sometimes used to attach the padlock or bail block or hoisting line to the dipper of the shovel.

13. *Crowding and retracting.*—Crowding and retracting are the functions of thrusting the dipper and the dipper stick (dipper handle) outward or inward.

14. *Padlock.*—The padlock, sometimes called bail block, is a sheave and its housing by which hoist line is connected to the dipper, either directly or through a bail.

15. *Shovel.*—Shovel dimensions, working ranges, clearances, and terms, see Fig. 2 and paragraphs 37, 38, 39, 40, and 41.

16. *Shovel dipper capacity rating.*—The rated capacity of the shovel dipper shall be not more than the number of cubic yards, or fraction thereof, obtained by multiplying the mean height of the dipper by the inside cross-sectional area of the dipper at one-half the minimum height. A variation of two per cent is allowed. The mean height is determined by taking one-half of the sum of the maximum and minimum heights of the dipper body including its minimum lip projection without teeth. If the dipper is of special shape, proper allowance shall be made for the increased or decreased volume.

17. *Crane, lifting.*—For lifting crane dimensions, capacities, speeds, and terms, see Fig. 1, paragraphs 37, 43.

18. *Crane size, lifting.*—The designated rating size of a lifting crane shall be expressed in short tons of 2,000 lb., and shall not exceed the maximum rated load without the use of blocking or outriggers, at a radius of 12 ft. from the center of rotation of the machine when it is equipped with the base rating length of boom. This 12-ft. radius is for rating purposes only, and may be more or less than the practical minimum operating radius.

19. *Lifting capacity—Lifting crane.*—The lifting capacity in pounds of a lifting crane in working order (cooling system full, fuel tank half full) at any given radius shall not exceed seventy-five per cent of the tip-over load at the same radius when working without the use of blocking at the least stable position, with the machine standing on a firm, level, and uniformly even supporting surface.

20. *Lifting capacity—Net load.*—In determining the load that can be lifted at any given radius or in deter-

mining the radius at which a given load can be lifted, buckets, fall blocks, slings, equalizer beams, and all similarly used auxiliary load-handling devices shall be considered as part of the load. Purchaser shall make allowance for all special conditions; such as, for instance, soft or uneven or inclined supporting surface, and suction or sticking of material in a bucket.

21. *Lifting capacity—Tabulation.*—Each declaration of lifting capacity in pounds shall always be accompanied by a figure showing the corresponding load radius in feet. A table showing the lifting capacities at various corresponding radii fulfills this requirement.

22. *Radius of load.*—The radius of load is the horizontal distance from the axis of rotation of the machine to a plumb line through the center of gravity of the suspended load with the machine standing on a level surface. (The outward swing of the load due to fast operation will reduce the safety factor, and should be considered by the purchaser in determining the safe load.)

23. *Rated load.*—Same as lifting capacity.

24. *Tipover load.*—The tipover load at any given radius for crawler mounted types of lifting cranes with tight tread belts resting on a firm, level, and even supporting surface, shall be that load which overcomes the stability of the machine in the least stable direction, to the extent that fifty per cent of the length of either crawler bearing on the supporting surface is lifted away from contact with the surface.

25. *Working radius.*—Same as radius of load.

26. *Dragline excavator.*—For dragline excavator dimensions, capacities, speeds, etc., see figure 1 and paragraphs 37, 43, and 44.

27. *Lifting capacity—Dragline or clamshell excavator.*—The rated lifting capacity of a dragline or clamshell excavator and the percentage of the tipover load on which it is based when working under the conditions described in paragraph 19 are to be stated by the manufacturer in his tender; see paragraphs 43 (d) and (e).

28. *Clamshell excavator.*—For clamshell excavator dimensions, capacities, speeds, and terms, see Fig. 1 and paragraphs 37 and 43.

General Requirements

29. Requirements for Diesel, oil-, or gasoline-powered machines are given herein. Electric and steam-powered machines of similar ratings are also available.

30. All machines sold as conforming to this standard shall meet the following general requirements.

31. *Backward stability.*—To avoid excessive or unsafe counter-weighting of machines and to insure proper backward stability when used as a lifting crane, dragline, or clamshell excavator, the center of gravity of any crawler-mounted type machine, resting on a firm, level, and uniformly even supporting surface, in working order (cooling system full, fuel tank half full), without load, with the base rating length of boom at its minimum working radius, shall not be farther from the axis of rotation than seventy per cent of the radial distance from the axis of rotation to the tipping fulcrum in the least stable direction.

32. *Propulsion.*—Each machine shall be capable of propelling itself either forward or backward.

33. *Steering.*—Each machine shall be capable of being steered either way in either direction of travel.

34. *Controls.*—Complete control of the traveling and steering functions shall be from the operator's position in the cab.

35. *Traction lock or brake.*—A traction lock or brake shall be standard equipment.

36. *Climb.*—Each machine shall have sufficient propelling power to climb a 30 per cent grade (30 ft. rise in 100 ft. horizontal) on smooth, firm, dry ground.

37. *Data.*—For each machine offered, the manufacturer shall furnish, for purposes of comparison, the general data indicated below:

- (a) Clearance height with boom lowered.
- (b) Height to top of cab.
- (c) Width of cab.
- (d) Rear end clearances radius of revolving frame.
- (e) Arc of swing, degrees.
- (f) Width of crawler treads.
- (g) Overall width of crawlers.
- (h) Overall length of crawler.
- (i) Length from center to center of crawler end sprocket or tumbler wheel shafts.
- (j) Approximate working weight.
- (k) Bearing area.
- (l) Developed brake horsepower of motor at governed speed, with statement as to whether horsepower ratings are with or without accessories.
- (m) Governed speed in revolutions per minute.

Detail Requirements

Shovel

38. *Shovel sizes.*—The standard sizes of shovels (dipper capacity ratings) generally available from American manufacturers are as follows: $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, and $2\frac{1}{2}$ cu. yd. Other sizes are available.

39. *Dipper size.*—The shovel dipper shall be of such proportions that it will handle its rated capacity as defined in paragraph 16.

40. *Shovel working range.*—The working ranges and dimensions for shovels shall be given for a boom angle of 45° .

41. *Shovel data.*—For each power shovel offered, the manufacturer shall furnish, for purposes of comparison, the detail data indicated below, in addition to those required by paragraph 37:

- (a) Shovel dipper capacity in cubic yards.
- (b) Length of boom.
- (c) Length of stick (handle).
- (d) Maximum dumping height for 45° angle of boom.
- (e) Dumping radius at maximum height for 45° angle of boom.
- (f) Maximum dumping radius for 45° angle of boom.
- (g) Maximum cutting height for 45° angle of boom.
- (h) Maximum clean-up radius at crawler tread level for 45° angle of boom.
- (i) Maximum digging depth below flood level.
- (j) Dipper single line speed.
- (k) Dipper single line pull.

Lifting Crane, Dragline or Clamshell Excavators

42. *Boom length.*—The base rating boom length for lifting cranes and dragline and clamshell excavators shall be as shown in paragraph 4, and will be furnished unless other available lengths are specified.

43. *Lifting crane and excavator data.*—For each lifting crane, dragline, or clamshell excavator offered, the manufacturer shall furnish, for purposes of comparison, the detail data indicated below, in addition to those required by paragraph 37:

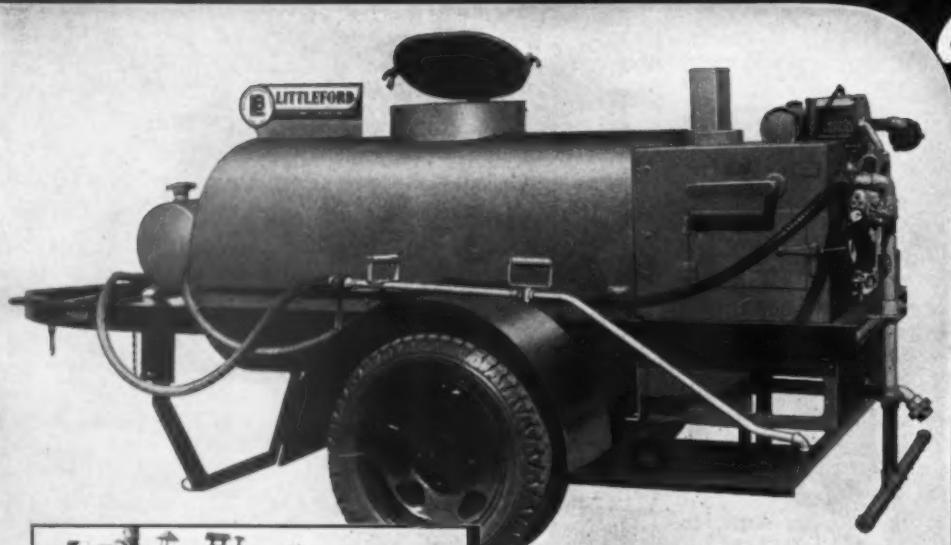
- (a) Lifting crane size in short tons at 12-ft. radius.
- (b) Length of boom.
- (c) Minimum practical operating radius.
- (d) Lifting capacities at 5-ft. increments of radius for the length of boom offered.
- (e) Assumed ratio of lifting capacity to tipover load in per cent.
- (f) Hoistline speed (single line).
- (g) Hoistline pull (single line).

44. *Dragline excavator data.*—For each dragline excavator offered, the manufacturer shall furnish, for purposes of comparison, the following detail data, in addition to those required by paragraph 43:

- (a) Dragline speed (single line).
- (b) Dragline pull (single line).



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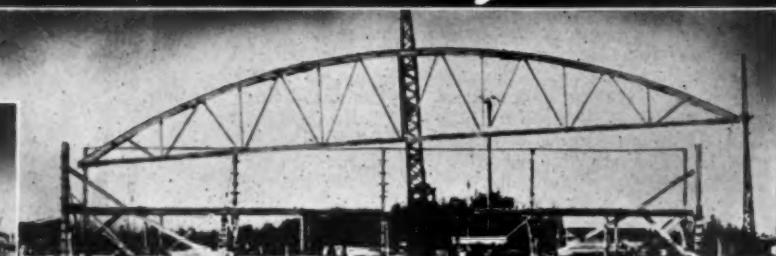


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EDITORIAL

THE PRESIDENT'S IDEA

ELSEWHERE in this issue is a full text of the message President Roosevelt transmitted to the Congress on defense roads. In his message he recommended an immediate appropriation of 125 million dollars for access roads and for strengthening bridges. The next to last paragraph of the message contains the statements of policy on how the money is to be expended. While the President never mentioned specifically that the money should be apportioned among and spent by the states, the inference to that effect is clear. It is important to note that authorizing legislation governing these funds "should provide for matching" in the same manner now followed with respect to federal-aid highway construction and provision should be made for the determination of the needs through certification thereof by the War or Navy Departments, or the Office for Emergency Management, and without regard to the usual apportionment formula."

In addressing the Eastern Conference of Motor Vehicle Administrators at Hartford, Connecticut, on May 15 on the subject "Organizing Traffic for Defense," Public Roads Commissioner MacDonald said in part:

"The other phase of this problem may be defined as extensive, and relates to the provision of highways of reasonable standards on the so-called strategic network. This network of routes of principal military importance includes approximately 75,000 miles. In this mileage there are presently over 5,000 miles of surface less than 18 feet in width; there are nearly 2,500 bridges of capacity of less than 30,000 pounds; and there are approximately 14,000 miles of road whose surface is incapable of supporting wheel loads of 9,000 pounds. To eliminate these deficiencies alone will require an expenditure of over \$458,000,000. Furthermore, there is a substantial mileage which is over 18 feet in width, but is still narrower than necessary for the proper accommodation of present and expected civilian and military traffic, and there is a common condition of narrow shoulders, a very general condition of excessive curvature, too steep grades, and inadequate sight distances."

The President undoubtedly appreciated this careful study made by the Public Roads Administration but decided that no necessity existed at this time for the complete program as set forth. He should know, he's running this show.

Congressional leaders, realizing the importance of prompt action, did not wait for the federal works administrator to submit a draft of a bill in accordance with the ideas expressed in the President's message. Senator Hayden and Congressman Cartwright simultaneously introduced legislation (S. 1580 and H. R. 4935) to meet the exigencies of the emergency. In its broader aspect, the Hayden-Cartwright bill carries out the spirit of the President's message while differing sharply with it on the apportionment suggestion and in other minor ways. The proposed legislation is sufficiently broad to carry out the recommendations of the Public Roads Administration in due course of time, while at the same time establishing effective and efficient control over the President's recommended immediate appropriation.

Plans are being made for immediate hearings before both Senate and House Road Committees on the proposed legislation.

Congress should closely scrutinize the possible locations of the projects on which the 125 million dollars

may be spent before committing itself to the regular federal-aid basis of apportionment and matching.

BE READY

THROUGHOUT the United States, road construction jobs are in full swing; bridge construction and reconstruction is under way. Men and machines are moving rock and dirt, bitumen and cement, to meet the requirements of the state, county, township, and city road and street programs. But what about the defense road program? Why is that not underway? With highway contractors ready and willing to go ahead on the program it is not understandable why legislation is withheld. Even before an ordnance plant, a powder factory, or a cantonment is built, the first task should be the building of a road to get to that area.

When the bill is reported out onto the floor of the House and it shortly thereafter becomes a law, army, navy, and defense manufacturing plant executives are going to start clamoring for immediate construction of the access roads. It behoves all state highway departments, therefore, to make the necessary surveys and prepare the necessary plans for these access and strategic highways even though this preliminary engineering work will have to be paid out of state funds. Let's be ready to move as soon as defense road funds become available.

PROVIDE POWER FIRST

WHETHER we like it or not, we are definitely a part of the conflict now raging in the Old World. Consequently it behoves us to build both hydro-electric and steam generating plants as rapidly as possible in order to prevent a repetition of what occurred during World War I.

The quoted paragraphs which follow were taken from the May, 1924, issue of THE EARTHTMOVER, and refer to World War I.

"It is not generally understood that soon after the entrance of the United States into the war the success of our war program was seriously menaced by the rapid exhaustion of reserves of central electric power. Inability on the part of the public utility companies to honor demands for additional power by customers with contracts for war supplies threatened to interfere seriously with the production of the equipment and munitions needed. 'Only the sudden end of the war,' reads a report to the war department, 'prevented this neglect to provide power from being shown by a serious shortage of power supply with which to meet the increasing demand for the equipment of an army of 5,000,000 men. Only the end of the war prevented conclusive proof that we had made the same mistake as England but to a smaller relative extent, providing our factories and raw materials and placing orders for finished materials without sufficient power to manufacture them promptly.'

Without sufficient power to produce the defense material required—the tanks, the guns, the planes, etc., it would be folly to spend for roadbuilding. We have, it will be recalled, been assured that power requirements in total are sufficient. However, supplementary power, we have recently been informed, will be required in the TVA area because of a dwindling runoff supply. With power properly placed in sufficient volume, roads then become an important consideration.

ABOUT CONTRACTORS and their JOBS

The following information is published as reports from field contact men after the style of the former Earth Mover and Road Builder magazine. The editors of ROADS AND STREETS do not verify or check any of the information. It is given here as the reports of men who are constantly contacting contractors in their respective areas.

ST. LOUIS AREA

*Reported by
O. B. AVERY*

Extension Work on Superhighway.—Bids for first work on a $\frac{3}{4}$ mile eastward extension of the superhighway, or Daniel Boone Parkway, from Lay Road to Brentwood Blvd., St. Louis County, were received by the state highway commission. Initial work, which will begin this spring, will be excavation of about 192,000 cubic yards of earth at estimated cost of \$100,000 to \$125,000. Bids for paving the whole stretch and for an underpass at McCutcheon Road will be received later. Right of way has been purchased for construction of the short section between Brentwood Blvd. and Hanley Road. Present plans are to end construction where the highway will enter Hanley Road at a point north of Eager Road, about $\frac{3}{4}$ of a mile south of Clayton Road. Engineers said the connection with Hanley Road would provide access to Clayton Road and the express highway in Forest Park. The 3.7-mile stretch of new highway, from Lindberg Blvd. to Hanley Road, will cost more than \$2,000,000 and is expected to be completed by the end of 1942. The highway will have two 24-ft. roadways, divided by a parkway.

Grade separation construction now is under way at Lindbergh Blvd., at the Warson and Clayton Roads junction, and at Lay Road. The Lindbergh and Warson-Clayton overpasses are expected to be completed next fall, although highway engineers said that a shortage of steel because of national defense needs might cause the contractors to fall behind schedule. The Lay Road separation will be an underpass.

Two other grade separations, one at Brentwood Blvd. and another at the Terminal Railroad crossing, will be constructed.

Toll Road Bill Approved.—The House Committee of the Missouri Legislature on Roads and Highways approved a bill by Representative Roy Hamlin (Democrat) of Hannibal, Mo., which would authorize the construction of a \$48,000,000 toll road between St. Louis and Kansas City. Hamlin told the committee the superhighway, which would be patterned after Pennsylvania's new turnpike, would be built with revenue

bonds, and would not cost the state a penny. The 236-mile proposed road, Hamlin said, would take the flow of traffic off U. S. 40 and U. S. 50, where there had been considerable congestion, and probably would relieve the state highway department of the necessity of rebuilding U. S. 40. Construction and operation of the toll road would be supervised by a proposed Missouri Turnpike Commission, consisting of the chief engineer of the state highway department and five members appointed by the Governor.

* * * *

Missouri River Work.—The Senate Appropriation Committee of Congress recommended an increase from \$3,200,000 to \$4,866,600 in the amount of money to be spent in the 1942 fiscal year for channel improvement work on the Missouri River. The committee added \$1,666,600 to the \$1,700,000 previously recommended for work between Kansas City, Mo., and Sioux City, Iowa, thus making \$3,366,600 available in that area. The \$1,500,000 originally proposed for work between the mouth of the river, near St. Louis, to Kansas City, was left undisturbed.

* * * *

City of St. Louis Department of Streets & Sewers Headed by Arthur C. Meyers.—Arthur C. Meyers, first assistant and budget director under Comptroller Louis Nolte, was appointed director of the Department of Streets and Sewers by Mayor Wm. Dee Becker. It is the first cabinet appointment by the Mayor since his inauguration April 15th and is effective May 1st.

Meyers takes the place of Frank J. McDevitt, who was director of the department for eight years under former Mayor Bernard F. Dickmann. McDevitt resigned a week after the election, April 1st, to become district manager of the St. Louis office of the Federal Defense Contract Service. After McDevitt's resignation, Mayor Becker appointed Assistant Engineer Roy C. Gans as Acting Director.

* * * *

Contractors at Work.—Following are some of the newer jobs in this area:

Moore Bros. Construction Co., East St. Louis, Ill., 0.52 mi. approaches to C. B. &

Q. R. R. overhead and Rte. 128A grade separation in Smithboro, Bond County—\$103,937.00.

Madison Construction Co., Edwardsville, Ill., 2.59 mi. of relocation of Route 11 in Bond County—\$140,927.00.

Hoeffken Bros., Belleville, Ill., 0.50 mi. spur to Scott Field from Route 16 in St. Clair County—\$24,400.00.

Hurden Construction Company is working on a \$32,482.00 job for Macoupin County on gravel or crushed stone surfacing of roads in Carlinville, Ill.

Dickie Construction Co., St. Louis, Mo., is doing a defense housing project at East Alton, Illinois; \$397,792.00.

Frank Trager, Braymer, Mo., 6.314 mi. of bituminous surfacing in Lawrence County; \$120,017.00.

Wm. F. Keeley Construction Co., E. St. Louis, Ill., 2.84 mi. of relocation of Route 11 in Bond County from south of Greenville northeast to Smithboro, Ill.; \$174,278.00.

Markham & Brown, Cape Girardeau, Mo., 0.364 mi. of grading, cement stabilization surfacing and bituminous surfacing treatment in Stoddard County, Mo.; \$91,381.00.

Harrison Engineering & Contracting Co., Kansas City, Mo., 9.713 mi. of 22 ft. concrete paving in Jefferson County, Mo.; \$333,173.00.

Atkinson-Windle Co., Chillicothe, Mo., 0.977 mi. of two 20 ft. concrete paving in St. Louis County, Mo.; \$60,438.00.

Atkinson-Windle Co., Chillicothe, Mo., 0.474 mi. of two 20 ft. concrete paving in Jefferson County, Mo.; \$38,043.00.

Neyer Construction Co., Billings, Mo., 9.111 mi. of grading and bituminous surfacing in Bates County, Mo.; \$158,525.00.

Otto Knutson, Kansas City, Mo., 1.354 mi. of grading and surfacing in St. Clair County, Mo.; \$9,891.00.

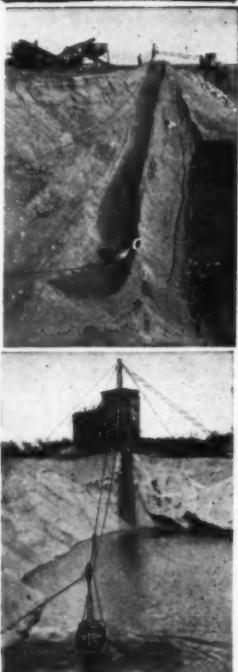
George R. Lemmon, Kirkwood, Mo., 0.049 mi. of bridges, etc., in Butler County, Mo.; \$43,719.00.

Chernus Construction Co., St. Louis, Mo., 0.712 mi. of grading and roadside improvement on U. S. 40, Lay Road to North and South Road in St. Louis County, Mo.; \$103,265.00.

Bridges Asphalt Paving Co., St. Louis, Mo., 1.379 mi. of grading, asphalt surfacing and widening in Pike County; \$125,043.00.

L. L. Sharp, Springfield, Mo., 2.426 mi.

SAUERMAN
Long Range
MACHINES



(Above) Two typical Sauerman installations—a Scraper at work in a dry pit and a Cableway in a wet pit.

**DIG, HAUL and DUMP
in One Operation**

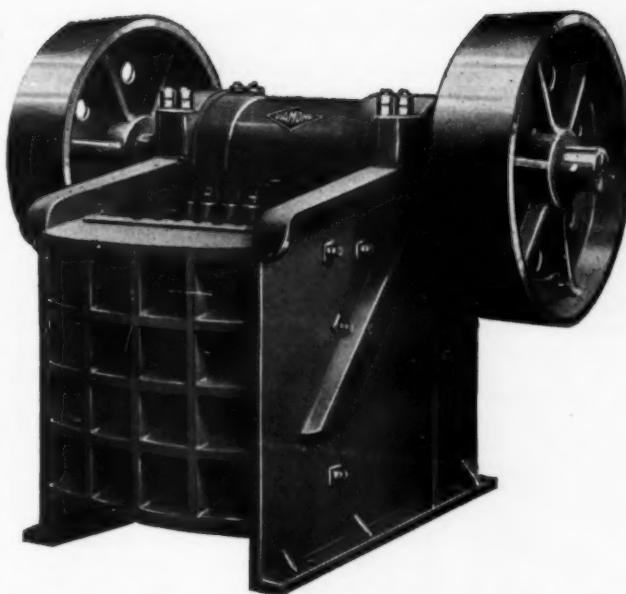
THIRTY years of successful service prove that Sauerman Scrapers and Cableways are the best machines in the world for long range material-handling, whether the job is pit or bank excavation, river dredging, spoil removal, cut-and-fill or stockpiling.

These machines will dig any material that a plough can penetrate. One man controls the entire operation. Power cost and maintenance are exceedingly low per cubic yard of material handled.

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Will gladly help you work out in the most economical manner any crushing, screening and conveying problems that may confront you. Their skilled service is at your command, and we will welcome your inquiry and give it immediate attention. No obligation, of course.

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Marvels of flexibility, high efficiency and economical operation, DIAMOND portable plants are built in a wide range of sizes and capacities. DIAMOND plants embody many exclusive and patented features, all making for easy portability, fast, uninterrupted, low cost operation and long years of dependable service.

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of grading and surfacing in Henry County; \$20,267.00.

Hoover Bros., Kansas City, Mo., 2,671 mi. of grading and surfacing in Lafayette County; \$10,398.00.

L. L. Sharp, Springfield, Mo., 4,530 mi. of grading and surfacing in Bates County; \$18,050.00.

Gaines Bros., Miami, Okla., 0,473 mi. of grading, bridges, and surfacing in Newton County; \$26,203.00.

Royce Zink, Appleton City, Mo., 3,976 mi. of grading, culverts and bituminous surfacing in Bates County; \$158,275.00.

Mid West Precote Co., Kansas City, Mo., 2,109 mi. of grading and bituminous surfacing in Bates County; \$126,899.00.

L. L. Sharp, Springfield, Mo., 2,963 mi. of grading, bridge surfacing in Vernon County; \$24,658.00.

Atkinson Paving Co., Chillicothe, Mo., 1,656 mi. of grading, bridges, and surfacing in Taney County; \$75,750.00.

Maxwell Construction Co., Columbus, Kansas, three bridges in Texas County; \$94,358.00.

O'Dell Riney Construction Co., Kirkwood, Mo., 0,023 mi. of bridges in Butler County; \$42,661.00.

Army to Erect \$546,000 Center Near Belleville, Ill.—A \$546,000 general army reception center is to be constructed on a 40-acre tract adjoining Scott Field, near Belleville, Illinois, as part of a new \$8,970,000 building program announced by the War Department. Construction details of the new center were not announced, but it was understood they would conform to the standard War Department pattern for such centers, embodying a complete unit in itself, with barracks, mess hall and hospitalization facilities. The size of the new center will be about the same as that at Jefferson Barracks, which also accommodates 10,000 men. The site for the new center has been acquired and construction work is expected to get under way immediately.

Jefferson Barracks Construction.—Low bids totaling \$2,480,097 were received by U. S. Army engineers for the construction of the 10,000-man Air Corps replacement center and hospital group at Jefferson Barracks. The work will begin next month and will be completed by October but the barracks will be occupied as they are built, with the first unit expected to be ready by July 15th. Joseph A. Bass of Minneapolis, Minn., submitted the low bid of \$1,112,600 for area No. 1 which will include 146 buildings of which 96 will be 63-man barracks. The area will accommodate 6,000 men. The Evans Construction Company of Springfield, Ill., was apparent low bidder on areas Nos. 2 and 3, each of which will house 2,000 men. The low bid on area No. 2 was \$422,473 and the bid on area No. 3 was \$254,770. The low bid on area No. 4, a hospital group to provide 376 beds and necessary laboratory buildings, and residential quarters for physicians and nurses, was \$695,254, submitted by O'Driscoll & Grove, Inc., New York.

Curtiss-Wright Expansion.—A \$4,609,494 expansion of the airplane manufacturing plants of the Curtiss-Wright Co.-po-

ration, of which \$1,673,460 has been earmarked for the new plant under construction at Lambert-St. Louis field, was announced by the War Department in Washington. The War Department said the expansion would be financed by the government and leased to the company. The supplemental agreement provides for additional machinery and equipment, revision in construction and land improvements.

Munitions Plant May Be Built Near Herrin, Ill.

The federal government is to award a contract soon for a munitions plant in southern Illinois, in the vicinity of Herrin, Ill., United Mine Workers officials of Illinois have been advised by state U. M. W. A. president, Ray Edmundson, in New York for a mine wage parley. When completed, Edmundson said, the plant will absorb from 6,000 to 8,000 unemployed miners and will greatly relieve the unemployment consequent upon the abandonment of mechanization of mines in southern Illinois.

Housing Project Contracts Approved.

The U. S. Housing Authority in Washington approved four contracts totaling \$2,362,317 for construction of Clinton Peabody Terrace, low-rent housing project to occupy eight blocks bounded by Chouteau and Park Avenues and 14th and Grattan Streets in St. Louis. The project will contain 657 units and is expected to start within the next few weeks. Completion is due in 15 months. Bids approved are: I. E. Millstone Construction Company, St. Louis, general construction, \$1,717,000; Fowler Plumbing Company, St. Louis, plumbing, \$256,320; W. C. Burns, Murphysboro, Tenn., heating, \$311,000; and Public Electrical Construction Co., Chicago, electrical work, \$77,997.00.

PITTSBURGH AREA

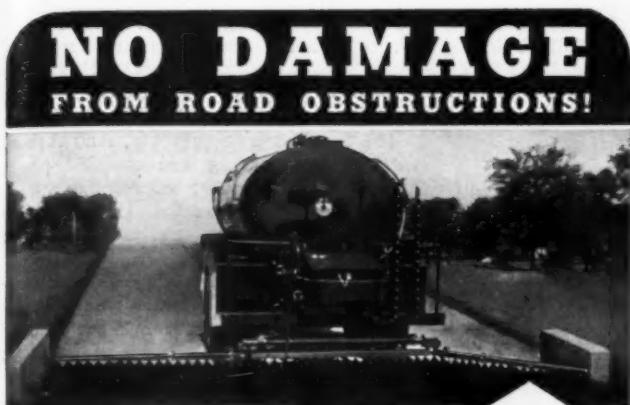
Reported by
JOHN W. PATTERSON

Nardulli Subs Grading.—Nardulli & Sons Co. are doing the grading on the Curtiss-Wright Corporation plant at Beaver, Pa. This work was awarded by the Hughes-Foulkrod Co. to Nardulli Co. a few weeks ago. Hughes-Foulkrod have the principal contract which entails an expenditure of \$5,221,000. Nardulli is rapidly completing the grading for this project and we understand he is well ahead of time. The building end of the work will probably be underway in the next few weeks.

Youghiogheny Dam.—One of the largest projects in this section of the country is Youghiogheny Dam. It is in connection with the chain of flood prevention dams in the Allegheny and Monongahela River basins. We understand the work will be started within a few weeks.

Bids have been received by United States engineers of Pittsburgh, Pa., for the construction of Youghiogheny River dam above McKeesport in Pennsylvania. The low bidder on this work was the Hunkin-Conkey Construction Co., Cleveland, Ohio, and Shofner, Gordon & Hinman, Los Angeles, Calif. The lump sum bid by the above companies was \$3,675,265.00. The second bidder was Geo. M. Brewster & Sons Co., Bogota, N. J., at \$3,988,541.00. The third bidder was a combination of Frank Mashuda Co., Milwaukee, Wis., John F. Bloomer, Appleton, Wis., Joseph D. Boness, Inc., Milwaukee, Wis., and Herman Holmes, Crystal Falls, Mich. The lump sum bid of this combination was \$4,461,775.00. The United States government estimate was \$3,656,188.00. The items bid by the low bidder were as follows:

Designation	Unit	Estimated Quantity	Unit Price	Amount
Clearing, grubbing and removal of existing structures	acre	27	2,200.00	59,400.00
Cofferdam	job	1	175,000.00	175,000.00
Common excavation	cu. yd.	680,000	.66	448,800.00
Rock excavation	cu. yd.	1,894,000	.66	1,250,040.00
Special rock excavation	cu. yd.	7,000	13.00	91,000.00
Crushing rock	cu. yd.	963,500	.21	202,335.00
Loading and hauling from stock pile	cu. yd.	100,000	.24	24,000.00
Excavation in borrow area	cu. yd.	770,000	.26	200,200.00
Selected impervious fill	cu. yd.	430,000	.09	38,700.00
Random fill	cu. yd.	1,793,000	.08	143,440.00
Filter fill	cu. yd.	79,000	.15	11,850.00
Rock fill	cu. yd.	791,000	.15	118,650.00
Rolling fill, for each additional 3-trips	square	440,000	.01	4,400.00
Rock gutters	cu. yd.	550	14.00	7,700.00
Settlement gages	job	1	1,000.00	1,000.00
Core drilling, 2-inch	lin. ft.	3,000	2.00	6,000.00
Percussion drilling	lin. ft.	42,000	.90	37,800.00
Furnishing cement	bbl.	68,000	2.15	146,200.00
Furnishing and installing anchor bars	lb.	180,000	.09	16,200.00
Furnishing and installing miscellaneous metal	lb.	15,000	.20	3,000.00
Pressure grouting	bag cement	20,000	1.00	20,000.00
Gunit	cu. ft. sand	2,000	1.00	2,000.00
Concrete in grout cap	cu. yd.	850	20.00	17,000.00
Concrete in spillway	cu. yd.	43,000	10.50	451,500.00
Porous concrete	cu. yd.	7,600	13.00	98,800.00
Concrete in gutters and headwalls	cu. yd.	310	22.00	6,820.00
Furnishing and installing corrugated pipe	lb.	230,000	.12	27,600.00
Porous drain tile	lin. ft.	9,300	1.30	12,090.00
Road surfacing	sq. yd.	9,600	.90	8,640.00
Highway guard fence	lin. ft.	4,600	1.00	4,600.00
Landscaping and planting	sq. yd.	8,000	.25	2,000.00
Reinforcing steel	lb.	700,000	.055	38,500.00

**SIMPLE FUNCTIONAL DESIGN***Keynotes 1941***ETNYRE BLACK TOPPERS**

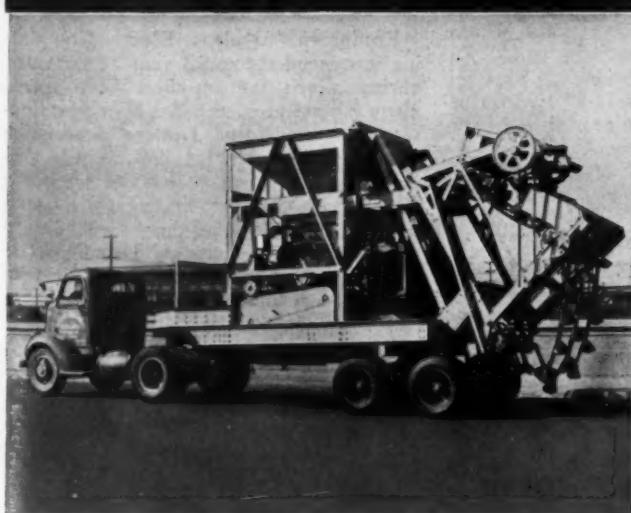
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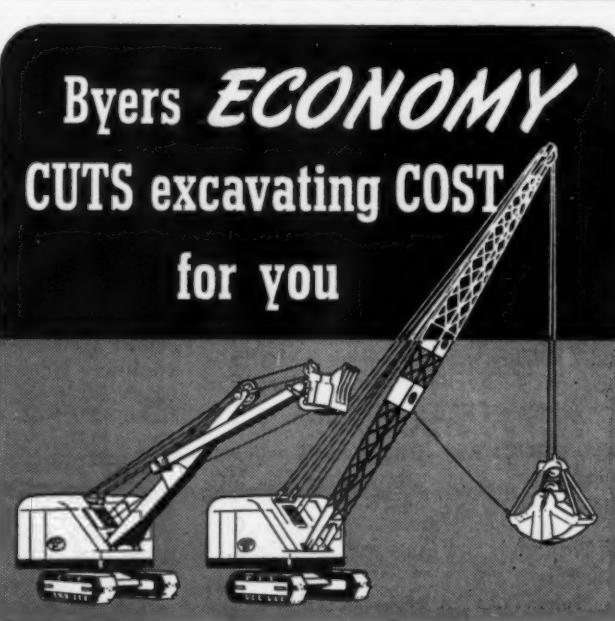
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RAVENNA, OHIO

Pennsylvania State Highway Work.—Some of the large jobs for which bids were taken by the Pennsylvania State Highway Department follow:

May 2—Holmes Construction Co., Wooster, Ohio, Potter & McKean counties. Lump sum bid, \$656,665.00. Grading item on this work involves 527,796 cu. yds. for which 42 cts. per cu. yd. was bid.

May 2—D. D. Mullett Construction Co., Aspinwall, Pa., Mercer County. Lump sum bid, \$149,820.00. Straight excavation item 37,336 cu. yd. at 40 cts. per cu. yd. Borrow excavation, 49,675 cu. yd. at 38 cts.

May 9—Sanctis Construction Co., Pittsburgh, Pa., Allegheny County. Lump sum bid, \$119,251.00. Grading item, 34,900 cu. yd. at 55 cts per cu. yd.

May 9—Midwest Construction & Asphalt Co., Uniontown, Pa., Fayette County. Lump sum bid, \$331,352.00. Principal grading excavation, 131,050 cu. yd. at \$1.37 per cu. yd.

The above contracts, we understand, will be started within the next few weeks, and will be completed in 1941.

* * * * *

Defense Housing Projects.—The Defense Housing Authority for Allegheny County with offices in Pittsburgh, Pa., have been allotted \$20,000,000 for ten to twelve defense housing projects in Allegheny County. Sites are being surveyed and plans are being made for the first of these projects. It is expected the work will be underway for the grading within the next six weeks. The projects will involve from 250 to 500 housing units.

* * * * *

New Airport.—It is expected that in the near future a new airport will be selected by the federal government in the Pittsburgh area. There is some talk of the Bell Farm in Moon Township, Allegheny County, as a possible location of this project, but there is nothing definitely forthcoming at this time. Acting WPA Administrator Howard O'Hunter in Washington, D. C., has announced approval of eleven airport construction projects involving an expenditure of \$8,000,000, including federal and sponsors funds. The eleven projects are included in the \$150,000,000 airport construction program that will extend to 350 defense sites. It is reported the program includes military and naval fields which have been specifically designated by the War and Navy Departments.

* * * * *

Saw Mill Run Boulevard.—Frank Donatelli & Co. have started their Saw Mill Run Boulevard job. This is one of the large jobs that is being done jointly by the City of Pittsburgh and County of Allegheny.

* * * * *

MONTANA AREA

Reported by
L. E. JONES

Kootenai Bridge.—McNutt Bros. of Eugene, Ore., have started work on the Kootenai Bridge, their \$244,633.50 job for the U. S. Forestry Service of Missoula, Mont. The bridge will be 942 ft. long, consisting of two deck truss spans of 220 ft. each, one of 264 ft., a plate girder span over the G. N. Ry. of 76 ft. and one of 75 ft. length, a 32 ft. approach span and two 25 ft. tower approach spans.

Director, U. S. C. of C.—O. S. Warren, publisher of the Great Falls *Tribune* and former Chairman of the Montana State Highway Commission, was recently selected as director of the United States Chamber of Commerce.

* * * * *

Resumed as Toll Bridge.—The bridge that crosses the Yellowstone River near Fairview, Mont., is no longer a free bridge for highway users, but has resumed on a toll basis.

* * * * *

Dam Meeting.—Considerable interest was recently manifested at a mass meeting of Flathead County citizens at Kalispell, for the early construction of Hungry Horse Dam.

* * * * *

The Montana State Association of County Commissioners held their annual meeting at Helena, Montana, June 9, 10 and 11.

* * * * *

Airport Contracts.—New work starting on airport construction for the U. S. Army engineers during the past three weeks are as follows:

G. R. Thomason, Atlanta, Georgia, the Belgrade Airport; \$58,000.

Thomas Staunton, Great Falls, Montana, the Great Falls Airport; \$132,000.00.

S. Birch Sons Construction Co., Great Falls, the Lewistown Airport; \$138,076.32.

Inland Construction Co., Omaha, Nebr., the Miles City Airport; \$94,800.00.

Peter Keiwitt & Sons, Omaha, Nebr., the Billings Airport; \$150,000.00.

* * * * *

MICHIGAN AREA

Reported by
J. M. TELFORD

New President M. R. B. A.—Walter Toebe of Munising and Lansing, one of Michigan's leading bridge-building contractors, is the new president of the Michigan Road Builders' Association, which is composed of road and bridge contractors. Mr. Toebe, who succeeds L. W. Edison of Grand Rapids, was vice-president during the past year. Other new M. R. B. A. officers are Harry Pickett of Allegan, vice-president; Herman Holmes, Crystal Falls, Upper Peninsula, vice-president; and L. W. Lamb, Holland, secretary-treasurer (re-elected). Floyd E. Koontz is executive secretary of the association.

Results of the election of officers were announced at the M. R. B. A. annual meeting which preceded the annual Road Builders banquet in the Hotel Statler in Detroit. Nearly 1,500 enthusiastic road builders, public officials and friends attended the banquet, the most successful on record.

* * * * *

Doing Splendidly.—Not so very many days after becoming the head of the M. R. B. A., Walt Toebe was presented with a son, Carl Walte. The infant and Mrs. Toebe, the former Lucille Fisher of the state highway department, are reported to be doing splendidly.

* * * * *

Contractors at Work.—Successful bidders of a state highway letting totaling \$546,632 were as follows:

Alpine Excavating Co., St. Ignace, 8,691 mi. of grading and aggregate surfacing from Nahma Junction north; \$117,867.55.

Charles Gosner & Co., Detroit, bridge south of Pellston; \$16,125.73.

The Lewis & Frisinger Co., Ann Arbor, 1,295 mi. of grading and concrete pavement south of Adrian; \$83,998.90.

Denton Construction Co., Detroit, 2,335 mi. of concrete capping and widening from U. S. 25 to Selbridge Field; \$147,275.86.

L. W. Brumm, Marquette, 0.716 mi. concrete pavement in Menominee; \$41,900.68.

Lee M. Perry, Beaverton, 0.5 mi. grading and stabilized aggregate north of Bradley; \$14,322.47.

Ray Kebbe, Warren, 2,164 mi. of grading and oil aggregate surfacing east of Oxford; \$46,235.

A. H. Proksch, Iron River, twin box culvert in Ontonagon; \$7,209.50.

The Cooke Contracting Co., Detroit, 5,248 mi. of oil aggregate west and south of Roscommon; \$25,580.50.

Clarence A. Hull, Dryden, twin box culvert north of Imlay City and south of Brockway; \$10,957.94.

T. P. Flynn & Co., Detroit, 1,988 mi. of oil aggregate in Manton and east; \$11,162.92.

* * * * *

Spring "Breakup".—Tremendous damage to all types of roads, from concrete pavements down to unimproved earth roads, resulted from the worst spring "break-up" Michigan has experienced in many years. Many secondary roads were impassable, and state highway and county road commission crews were kept busy maintaining traffic on the more important arteries. A high water table and absence of warm spring rains to remove the frost from the ground combined to soften road bases. Cost of maintaining and repairing these roads was so heavy that, in several counties, the season's construction programs were endangered.

* * * * *

Equipment Dealers Elect.—Completing its second successful year of existence, during which the members have solved many mutual problems, the Michigan Construction Equipment Dealers Association elected new officers for 1941. Arnold Andersen of Muskegon was chosen president; J. M. Telford of Lansing, first vice-president; John Earle of Detroit, second vice-president; R. C. Mertz of Detroit, secretary-treasurer; and Maurice J. Baker of Lansing, assistant secretary.

* * * * *

WPA—Contract Job.—H. L. Johnson and P. G. Greene were awarded a \$53,200 contract for approximately 400,000 cu. yd. of earth moving at the Kalamazoo airport, the second WPA-contract project of this type in Michigan.

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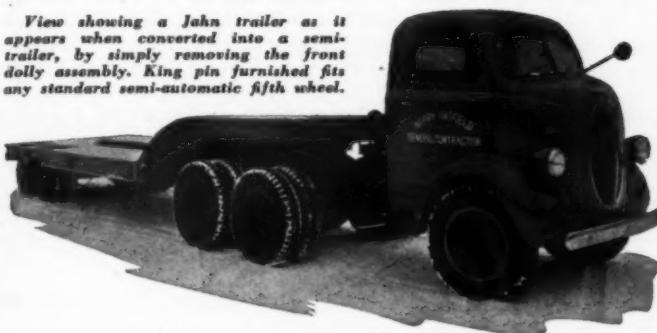
County Road Job.—A new bridge, first step in a relocation project on the Hart-Walkerville road, has been placed under construction by the Oceana County Road Commission.

* * * * *

Commission Moves.—The Shiawassee County Road Commission has moved into its new building in Corunna.

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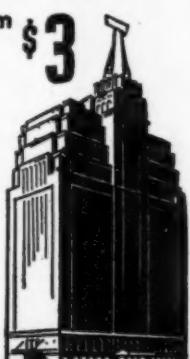
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KANSAS CITY AREA

Reported by
PAUL L. MATCHETTE

Builds 19 Mi. Railroad.—Mike Curran has just finished one of the toughest jobs in this part of the country. On January 20 he took over the building of 19 mi. of main line railroad track and several miles of passing track to be built from the Frisco Railroad main line into Fort Leonard Wood, Missouri.

Fort Leonard Wood is located approximately 50 miles south of Jefferson City, and about 75 miles east of Springfield, Missouri, in the Ozark Hills. The job consisted of moving 1,500,000 cu. yds. of excavation.

The railroad was built through extremely rough country. In several places the grade was 2½ per cent. Excavation varied from solid rock to dirt some cuts being as much as 50 ft. deep.

The work was done in the worst season of the year and was carried through some very bad weather. On April 19, 1941, Mike turned the railroad completed over to the fort. In other words, in 90 days he did what most people said would be impossible.

Mike is general superintendent for O'Dell and Riney Construction Company, with headquarters at Hannibal, Missouri. Mike was formerly general superintendent for Garrett Construction Company, Springfield, Missouri, and was associated with M. E. Gillioz, Monet, Missouri. All three of these

companies are large operators and all have the highest praise for Mike Curran.

* * * * *

St. Louis Ordnance Plant Ahead of Schedule.—Massman Construction Company, headquarters in Kansas City, in connection with Fruco Construction Company, of St. Louis, is building the new St. Louis ordnance plant, and from all reports are running ahead of their schedule.

The Massman Construction Company had a great deal to do with the building of the Fort Peck dam, and have just recently finished the large Grand River dam project at Vinita, Oklahoma.

* * * * *

Build New Bomber Plant.—S. Patti Construction Company, of Kansas City, and Tarleton and McDonald Construction Company, St. Louis, are building the new airplane bomber plant in Kansas City, Kansas. Their contract amounts to \$3,706,000. Mr. Patti has the reputation of being one of the best construction men in the Southwest. This is to be a hurry-up job and the government is to be complimented on having a man of Mr. Patti's type handling the contract.

* * * * *

Porter-Dewitt Finishes Wappapello Dam.—Porter-DeWitt Construction Company has finished building the Wappapello dam in southeastern Missouri. This was a real job, in fact, a big job, as the yardage of earth moved amounted to over 5,000,000 cu. yds.

* * * * *

City Manager of Oklahoma City.—Mr. H. E. Bailey, of Perry, Oklahoma, formerly a member of the Oklahoma State Highway Commission, is now the new City Manager of Oklahoma City. Mr. Bailey is an engineering graduate of the University of Tennessee, and has had 20 years of experience as a practicing engineer.

The men in the highway department were sorry to see him leave. Oklahoma City is a great place, and with Mr. Bailey managing the city affairs, it is going to be a still better place.

* * * * *

W. T. Schlichter on Road to Recovery.—W. T. Schlichter, of Clay Center, one of the best known bridge and road contractors in the state of Kansas, has been having quite a seige in Bethany Hospital in Kansas City, Kansas. For the past fourteen weeks, Bill has been down on his back and has had several blood transfusions to keep him going. From all reports, Bill is coming out of it in good shape and his friends will be glad to know he is on his way to recovery.

* * * * *

James Coffey Retires.—After thirty-one years in the dirt game, James Coffey, of Junction City, Kansas, sold his business. Jim started out with one team of small mules, and the other day sold his outfit complete for \$75,000 to Ed Clarkson, of List and Clark, Kansas City, and Claire Miller, of San Ore Construction Company, McPherson, Kansas.

Jim made the statement the other day there wasn't a dirt contractor in the business in Kansas today who was on the job when he started. We all hate to see Jim retire, but we are still hoping that he will attend the lettings so as to liven up the poker games and help the boys get well.



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SISALKRAFT has the toughness, the high wet-strength, the scuff resistance and the "workability" for fast handling — thorough curing — and many re-uses.

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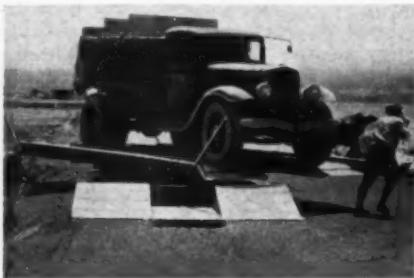


Chicago 205 W. Wacker Drive
New York 101 Park Avenue
San Francisco 55 New Montgomery St.

NEW EQUIPMENT and MATERIALS

Improved Truck Turntable

Speed is the keynote of current construction, particularly where National Defense projects are directly or indirectly involved, and American equipment makers are busy turning out time-savers for the construction industry. One of these construction short-cuts is the recently improved Blaw-Knox truck turntable, which permits trucks to turn around in restricted spaces. The turning mechanism is simplicity itself, consisting of a circular pan or "sled," and the whole table turns on this sled. Both single and double end turntables are furnished, in capacities up to 27 tons gross load, and one man can turn a loaded table. Ramps are always furnished with the single end turntables, and these are attached at one end with a bumper rail provided at the opposite



Recently Improved Blaw-Knox Truck Turntable

end; one model of the single end turntable includes a hinged ramp. Steel ramps at each end can be furnished for double end turntables if desired, or the purchaser can build his own ramps of wood from detail drawings furnished by the Blaw-Knox Co. Wherever trucks may be turned or backed, the turntable offers the advantage of permitting more truck trips per hour because it saves the time of backing and turning, eliminates lost time in backing long distances, expedites delivery of batches to the paver on paving construction, avoids cutting up of subgrade, and saves wear and tear on the trucks. So varied are the uses for this type of equipment that turntables are being used to expedite the construction of naval bases, to facilitate the loading or unloading of ships, and to simplify the construction of tunnels—units are even being rushed to Alaska! Further information may be obtained by asking for Bulletin 1822, or by writing to the company at its Pittsburgh, Pa., offices.

New High-Speed Mobile Crane

A new high-speed mobile crane has been added to the line of R. G. LeTourneau, Inc., Peoria, Ill. It has boom lengths of 20, 30 and 40 ft. and a lifting capacity of 10 tons. It has traveling speeds, up to 14 miles per hour. One of the main features claimed for the Tournacrane is its quick, easy interchangeability with other Tournapull tools such as Carryall Scrapers and Tournatrailers. It is stated that 15 or 20



The Tournacrane

minutes will convert a high-speed rubber-tired Tournapull from earthmoving with Carryall Scraper to a wide range, lifting tool that will handle many lifting problems.

New 60-Cu. Ft. Air Compressor

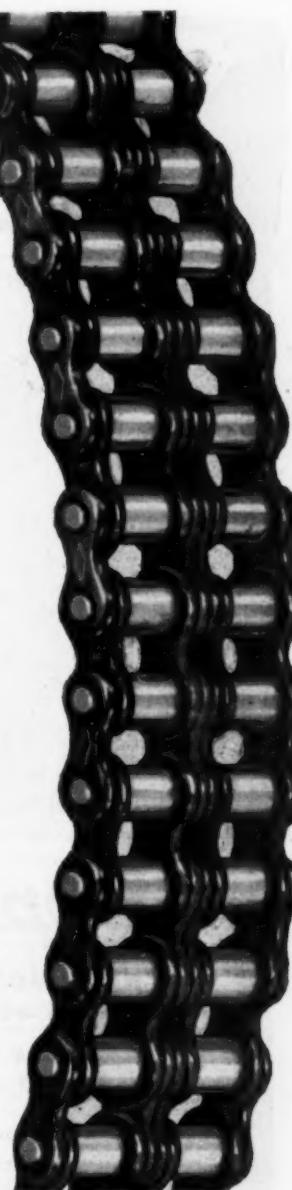
A new 60 cu. ft. portable air compressor has just been perfected and announced by Le Roi Co., 1706 S. 68th St., Milwaukee, Wis. It is a 2-cylinder single stage machine which may be secured on

No Time for Delays on Construction Projects Today

Cantonments, ordnance depots, barracks, highways, airports and other important projects are requiring the best the construction industry can offer.

Leading manufacturers of construction machinery make sure of the drives through the use of DIAMOND Roller Chains. Years of field performance have proved to maker and contractor that DIAMOND Chains have the reserve capacity, long life and durability so essential today to get jobs done and eliminate delays.

To insure the same drive efficiency always, experienced construction men always specify DIAMOND Chains for replacements, too. DIAMOND CHAIN & MFG. CO., 473 Kentucky Avenue, Indianapolis, Indiana. Offices and Distributors in All Principal Cities.



DIAMOND

**ROLLER
CHAINS**





New Le Roi 60 Cu. Ft. Air Compressor
two pneumatic tired wheels, or on skids.

The modern sheet steel housing offers a pleasing appearance as well as protection from the weather. Lockable hinged hood sides, when closed, cover the ample tool boxes preventing any tampering. When in a raised position, the sides rest in deep notches and cannot be accidentally dislodged.

Included as standard equipment on the new model are the following: an exceptionally large air receiver holding 7 cu. ft., retractable caster wheel support, double-acting towing eye, complete electric starting system, hinged hood sides, pneumatic tires, spring mounted chassis, 4 in. front and rear reflectors, and large oil, gas and water capacities. Internal features include force feed lubrication, circular plate type

compressor valves, unit construction with one crankshaft serving both engine and compressor, rigid connection between engine and compressor, valve-in-head engine, oil bath air cleaners, drop-forged connecting rods, steel-backed, babbitt-lined precision bearings, and wet sleeve engine cylinder.

New Thin Hex Nuts

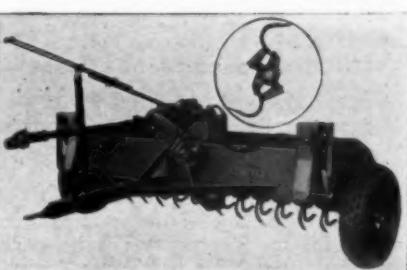
For use on shear bolts where a high degree of the stress is lateral, and for general application to light and medium stress fastenings, an improved line of thin

hex nuts is announced by Elastic Stop Nut Corporation, 2332 Vauxhall Road, Union, N. J. These nuts have approximately 40 percent of the strength of standard-height hex nuts and have been de-

veloped to meet the demand in virtually every industry for a self-locking fastening which offers savings in space requirements, weight, and cost. An indication of their suitability is the fact that they are approved for use on aircraft by all of the military and civil authorities. As in the standard-height Elastic Stop Nuts, the self-locking action is accomplished by means of a vulcanized fiber collar which is built into the head of the nut. This tough bone-like material resists the entry of the bolt, thus forcing the nut outward and taking up all thread play. The fiber, being non-metallic and of a resilient character, does not deteriorate under vibration, and so continues to hold the threads of nut and bolt in a constant pressure-contact. The nuts are available in steel, brass, and aluminum, in a complete range of standard sizes, both coarse and fine thread. A folder, sent upon request to the manufacturer, explains in detail the Elastic Stop self-locking principle.

New Model Ariens Aggmixer

For highway stabilization and mixed-in-place construction, the Ariens Co., Brillion, Wis., has announced a new model "Ariens Aggmixer." The Aggmixer is used in conjunction with other road equipment, and operates from the power take-off shaft of any suitable tractor, wheeled or track type. One of its new features is the rubber mounted tines. In operation, these sharply pointed tines forcibly throw the mixture against the inside of the enclosure hood, pulverizing and mixing it, as the tines re-



New Model Ariens Aggmixer

Parmanco HORIZONTAL DRILLS



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PARIS MANUFACTURING CO., INC.
PARIS, ILLINOIS

volve. Accurate and positive depth adjustment is provided by stops on each side of the Aggmixer that are set to the required depth before beginning operation. The Aggmixer is easy to operate, with all controls arranged to be adjustable for any tractor. The operator does not leave the tractor seat to operate the tractor controls. A push or pull by the tractor operator raises or lowers the Aggmixer, without loss of time. All the operator does is reach backward to raise or lower it. The machine has a power hydraulic lift, and individual hydraulic rams for lift and adjustment for each wheel. The total lift on each wheel is 15 in.

New Wagon Drill

A new wagon drill, especially designed for deep hole drilling up to 40 ft., has been added to the line of the Chicago Pneumatic Tool Co., 6 East 44th St., New York. Feeding the drill to the work is by gravity, due to the weight of the drill with mounting slide and adjustable weights; raising is by means of a hoist (air or hand); labor and fatigue are thus reduced to a mini-

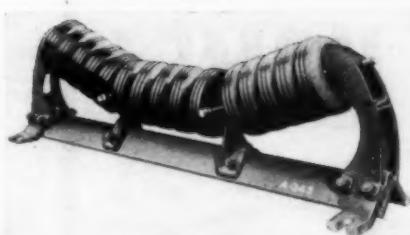


New G-500 Wagon Drill

mum. Operated by a hand crank the tilting tower permits quick and easy adjustment from 25 in. either side of vertical, in addition a lateral adjustment of 7½ in. either side of vertical facilitates angle drilling and compensates for rough and sloping surfaces. A dependable locking device holds the tower in any desired position. The rear wheels can be quickly and easily turned at right angles (tandem) for line drilling or broaching and to facilitate drilling close to bank or wall. A CP drifter suitable for any formation or depth of hole may be readily mounted on the wagon drill. To secure maximum results, however, the 4-in. CP-70 Drifter is recommended for practically all conditions.

New Pneumatic Roller

A new pneumatic roller, for carriers on belt conveyors, wherever the shocks of impact are excessive, has been introduced by the Stephens-Adamson Manufacturing Co., Aurora, Ill. These pneumatic carriers are specially designed for use under load-



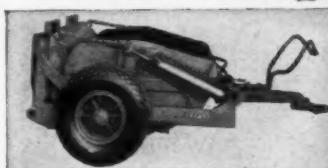
New Pneumatic Roller

ing spouts and in belt feeders where the impact of heavy bulk loads subject both conveyor belt and carrier to abnormal strains and wear. To cushion the impact of materials (and thereby prolong conveyor belt life), the rollers in these car-

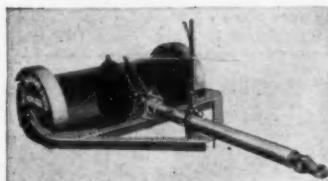
riers are made up of a series of pneumatic rubber units, 6 in. in diameter, suggestive of miniature automobile tires. The rollers in Stephens-Adamson Impact Carriers are mounted on the steel hub in which bearings and shaft are housed. Roller units have thick, wear-resisting treads and are inflated and permanently sealed to prevent loss of air. The assembly is built for easy servicing and quick replacement of damaged units. The carriers are identified as "Style No. 711 Pneumatic Impact Carriers."

Portable Electric Grease Gun

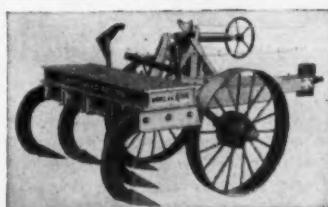
A self-powered portable electric grease gun has been placed on the market by Pressurelube, Inc., 507 West 56th St., New



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Three easy loading models—3, 4 and 6 cu. yd. capacities for any tractor.



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Automatic, Full revolving—in 5, 6 and 7 foot sizes for any tractor.



ROAD ROOTERS
5 tooth, with 5 ft. cut. Built in two models for tractors up to 50 H.P.

Baker Bulldozer on Harris County, Texas, flood control project

Much more is expected of road and earth moving equipment today than ever before. It has to be good . . . and fast! Baker Bulldozers and Gradebuilders are measuring up to their jobs because they have everything it takes to keep things moving—smooth hydraulic control, tremendous down pressure and the necessary stamina to handle the toughest assignments. Baker Hydraulic Scrapers, Automatic Rotary Scrapers and powerful Road Rooters have long been recognized as leaders in the highway maintenance equipment field. Let them help you solve your problems efficiently and economically.

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Division of Chicago House Trailer Co.



Pressurelube Grease Gun

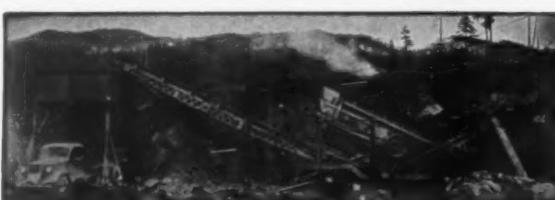
York City. Some of the features of the unit include:

Special Pressurelube hi-pressure hose will withstand pressures up to 40,000 lb. per square inch. Precision made all-metal high-pressure hand gun. No washers or other weak points to cause leakage and wastage under highest pressures. Plug-in socket for ordinary light socket connection for charging battery at any time when gun is not in use. One battery charge sufficient for more than 5,000 grease "shots" at ordinary pressures. Ammeter shows charging rate when connected to ordinary light socket for recharging battery. Power supply unit containing high-grade 23-plate standard type battery with built-in G. E. Tungar charger. Pressure indicator for adjustment to any required pressure from 1,000 to 12,000 lb. per square inch. Worm-gear drive power unit. Precision built of quality materials for long operating life. Easy running, ball-bearing wheels with pneumatic or solid tires, requiring minimum pulling effort.

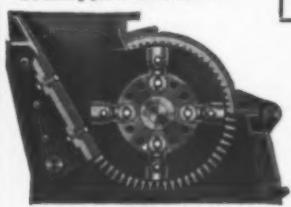
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HAMMER CRUSHERS from 1 ton per hour to 500 tons per hour capacity.



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Portable
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On mountainous road work GRUENDLER equipment is better fitted to produce crushed rock in sizes to meet exact specifications. All parts exposed to wear are constructed oversize to meet the most trying conditions—the Portables are moved to and from slopes and cut ins with ease and without danger of tipping.

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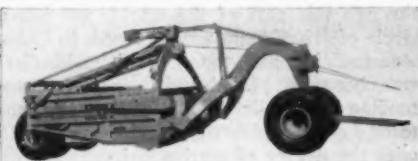


New Concrete Breaking Machine

building and the machine moved around the building wherever needed. They can also be used for outside work. One model is the push type which is handled by three men: One to operate the hammer and two helpers. All four wheels on this machine swivel to allow the device to travel in any direction. This model weighs approximately 1,000 lb. The height is 8 ft. 6 in., width of 4 ft. and a length of 7 ft. By removing three pins and loosening two bolts the entire superstructure including the hammer and cylinder can be removed from the machine. It can easily be towed behind any light truck or truck mounted compressor. The other model is designed for buildings and street work. The running gear on this machine is similar to an automobile and is propelled by an air motor. The boom on this model is longer and is made to swivel, which allows it to cut the width of the front wheels which is 7 ft. 6 in. By removing the braces holding the boom, the boom folds back by a method of ring and worm gear at the base of the boom which allows boom and hammer to rest on the frame of the machine when ready to transport to another job. This model requires two men: One to operate hammer and a helper. The weight of this machine is approximately 1,400 lb. The height is 8 ft 6 in., a width of 7 ft. 6 in. and a length of 10 ft.

New Double Bucket Scraper

R. G. LeTourneau, Inc., Peoria, Ill., has introduced the Model FU Carryall cable-controlled Scraper, a patented double-bucket model Carryall with a struck capacity of 17.7 and a heaped capacity of 23 cu. yd. It is stated that because of this patented double-bucket design, loading is made easier and capacity increased. The Model FU can be used behind the standard D8 tractor and loaded either with or without a pusher. LeTourneau's patented double bucket feature incorporated in the Model FU gives the effect of loading two small Carryalls one after the other. The rear bucket tele-



New LeTourneau Double Bucket Carryall

scopes forward and is loaded separately. After the first bucket is loaded to capacity, it travels back on rollers and roller bearings instead of being forced back, thus reducing loading resistance and giving larger possible loads for expended tractor effort. The second or front section of the bowl is then easily heaped high with the D8 tractor power. Positive, wipe-out ejection tailgate gives accurate control of spread. Single dead-ended cable on either side of the bowl pulls the tailgate from the vertical load center, thus reducing friction and wear on tailgate rollers and cable. To keep the sheaves entirely free from dirt, cable is dead ended on the apron and a sliding block sheave assembly mounted upon springpipe. A goose-neck or swan-neck yoke gives increased clearance for large single or dual

tires when working over uneven ground. The Model FU may be equipped with a large variety of tire sizes. The front may have either two (24x32)s, two or four (18.00x24)s, the rear either two (24x32)s, or four (18.00x24)s.

New Lubricant

Development of a viscous track roller lubricant for crawler type tractors, which is also suitable for army tanks of similar mechanism, has been announced by Standard Oil Company of Indiana. The new product protects against dirt and other contaminants, has high resistance to water and has a consumption ratio 20 to 25 per cent lower.

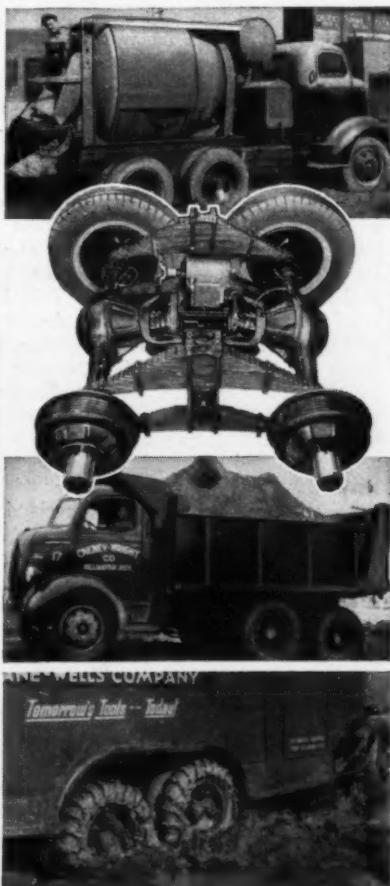
WITH THE MANUFACTURERS

J. A. McCoy Appointed Representative of Logan Engineering Co.

The Logan Engineering Company, Chicago, makers of Aridifier air and gas cleaners, advises that J. A. McCoy, 1436 41st Place, Des Moines, Iowa, is now representing them in the entire state of Iowa. Mr. McCoy, an old-timer in engineering selling, has been serving Iowa industrials for more than twenty years with recognized lines of industrial equipment and is well known in the construction field.

Do You Want to Save on Hauling Costs?

Here's a sure way to make substantial cost reductions on your hauling. Truck users in more than a score of industries report savings as high as 40% on investment, 30% on operating costs and 35% on upkeep expense.



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You save on investment since instead of buying a big, heavy-duty truck you select a smaller unit of any standard make—one priced low as a result of mass production.

ADD A THORNTON DRIVE

Your nearby Thornton distributor will quickly add a Thornton Four-Rear-Wheel Drive—a correctly-engineered unit with all necessary reinforcements that become an integral part of your truck.

HAUL DOUBLE THE PAY LOAD

You'll have a truck that will easily haul more than twice the usual load and likewise assure better traction for hill, hole or soft ground. Thornton inter-axle two-speed transmission gives speed for the highway and big gear reduction for heavy pulling.

YOU SAVE IN EVERY WAY

First cost is far less than that of a conventional truck of equal capacity. Operating and upkeep costs are less. Speed and tractive effort are greater. Six-wheel braking provides greater safety. In fact, from every standpoint you'll save money and do a better job with a Thornton Drive.

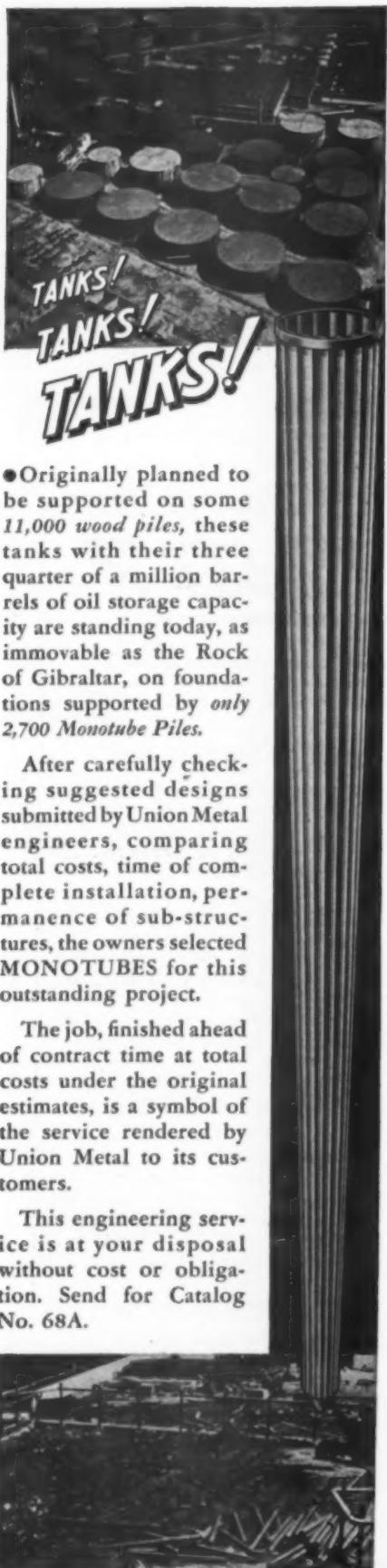
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CANTON, OHIO

Recent Distributors for the Hercules Co.

The Hercules Co., Marion, O., has appointed the following distributors for the Hercules Ironroller: The Petrie Machinery Co. of 501 North Broadway, Billings, Mont., in the central portion of the state of Montana. The H. P. Kelly Equipment Co., 2101-2115 Florence Ave., Cincinnati, O., in the Cincinnati Area, including adjacent portions of Kentucky and Indiana. The Empire Equipment Co., 824 North Main St., of Sioux Falls, S. D., in the state of South Dakota.

G. L. Cunningham Appointed Manager Technical Service Department Columbia Chemical

W. I. Galliher, Director of Sales, Pittsburgh Plate Glass Co., Columbia Chemical Division, has announced the appointment of Dr. G. L. Cunningham as manager of the Technical Service Department. Dr. Cunningham joined the Pittsburgh Plate Glass Co. in September last year after having served as Research Chemist at Mathieson Alkali Works since 1930.

Bob Peterson Is Dead

Robert M. Peterson, assistant advertising manager of the American Steel & Wire Co., died suddenly May 30 in Scottsdale, Penn., where he was spending the holiday. Mr. Peterson was born in Iron River, Mich. He came to Cleveland, O., in 1921 as district sales manager for the General Fireproofing Co. After that company was absorbed by the Truscon Steel Co. he became a special field representative for the latter concern. Mr. Peterson remained with Truscon until 1933. He spent that year and part of 1934 doing special work for the chairman of the board of the Fourth Federal Reserve District. He joined the sales promotion and advertising department of American Steel & Wire in March, 1934. From 1921 until 1934 Mr. Peterson was active in the Cleveland Builders Exchange, which he served as house committee chairman. Mr. Peterson was a 32d degree Mason, a Shriner and a member of the Shrine Luncheon Club. He was a member of First Baptist Church of Greater Cleveland and had been a member of the church board. Mr. Peterson lived at 3413 East Scarborough Road, Cleveland Heights, with his wife, Johanna A., and a daughter, Roberta. His mother, a brother and a sister also survive him.

Link-Belt Promotes Ewell and Woerwag

George L. Morehead, vice president in charge of eastern operations, Link-Belt Company, announces that Laurence M. Ewell has been appointed general manager of eastern division operations, with headquarters in Philadelphia. Mr. Ewell, who has until now been export manager, and manager of the company's New York office, will be succeeded in that position by his very able assistant, Carl A. Woerwag, with headquarters in New York as heretofore. Mr. Ewell, a graduate of the Link-Belt engineering department, entered the employ of the company in Philadelphia in 1906,



L. M. Ewell
C. A. Woerwag

and advanced successively through the drafting and estimating departments. Later he was transferred to the sales department; sent to the Pittsburgh office in 1911, and in 1915 returned to the Philadelphia plant sales department. Since that time, he has been constantly employed in the sales department, variously as sales engineer and branch manager of Link-Belt offices in Philadelphia, Chicago, St. Louis, and New York. In his capacity as export manager he has traveled extensively in the company's interest, particularly throughout Central and South American countries. Mr. Ewell was born in Dorchester County, Maryland. He was educated in private and public schools in Baltimore, Md.; at the University of Maryland; and at the U. S. Naval Academy, from which he was graduated in 1906. Carl Woerwag entered the employ of the company at Philadelphia in 1910, in the drafting room. In 1914, he became squad engineer in charge of boiler plant and gas house conveyor work. He left Link-Belt in 1917 and became an ordnance inspector in the U. S. Army, returning to the company in 1919, as sales engineer in the export department, with headquarters at the New York office. He soon became interested in the work the company was doing among the cane sugar mills and refineries and made his first visit to the West Indies in 1920, to become more thoroughly acquainted with this branch of the business. He has since been making yearly trips through this part of the world, and has a circle of friends and acquaintances in Cuba, Puerto Rico and the other islands. Carl was born in Philadelphia, and after attending the public schools of that city, entered Lehigh University, graduating in 1910 with the degree of mechanical engineer.

New Distributor for Marion

The Marion Steam Shovel Company, Marion, Ohio, announces the appointment of Walling Tractor & Equipment Corporation, Portland, Oregon, as its distributor for the entire state of Oregon and seven counties in southwestern Washington. This distributorship goes into effect immediately and takes into consideration Marion shovels, draglines, clamshells, cranes and pull-shovels up to 2½ cu. yd. capacity.

C. F. Rassweiler Appointed Director of Research for Johns-Manville

The appointment of Dr. C. F. Rassweiler as Director of Research of Johns-Manville Corporation has been announced by Lewis H. Brown, President of the corporation. Dr. Rassweiler has been director of the Philadelphia laboratory of

E. I. duPont de Nemours Co. In his new position Dr. Rassweiler will be a member of the Officers Board in charge of Johns-Manville's extensive research activities on which the company is spending close to a million dollars annually. About 200 research scientists, engineers and assistants are employed in the J-M Research laboratories located at the company's largest plant in Manville, N. J. More than half of Johns-Manville sales today come from products which have been added by the company's research, development and expansion program of the last twelve years.

Worthington Honors Loyal Employees

In appreciation of loyal and cooperative service, H. C. Beaver, President of Worthington Pump & Machinery Corporation, has just distributed more than 2,800 lapel emblems to employees who have completed five years or more of service. Nearly one-half of the total workers employed by Worthington were so honored. Close to 200 of the group were in the 25 to 29 year class, fifty-four ranged from 30 to 39 years and eleven have been employed for over a half century. The Worthington organization, entering its 102nd year of service to many fields—and now largely engaged in production vital to national defense—points with pride to these craftsmen who have helped to build an outstanding record of achievement.

East Coast Equipment Co., Inc., Appointed Bucyrus-Erie Distributors

East Coast Equipment Co., Inc., of Miami, Fla., have been appointed distributors for Bucyrus-Erie $\frac{3}{8}$ -yd. to $2\frac{1}{2}$ -yd. shovels, draglines, clamshell and lifting cranes. Their territory covers the counties of Dade, Broward, Collier, Glades, Henry, Indian River, Martin, Monroe, Okeechobee, Palm Beach and St. Lucie in the State of Florida.

New Ryerson Reinforcing Manager

Frank F. Trierweiler has been appointed manager of the Concrete Reinforcing Division of Joseph T. Ryerson & Son, Inc., to take the place of E. W. Langdon who filled this position for many years and who died on May 1, 1941.

He will have general supervision of the reinforcing business at all Ryerson plants with headquarters at the Chicago office. Mr. Trierweiler was graduated in civil engineering from the University of Michigan in 1915, and became associated with Thomas R. Kimball, architect, in Omaha, Neb. He served for two years as Captain of Engineers in the 42nd Rainbow Division in France during the World War. After a year with Kalman Steel Co. he entered the general contracting business at Portland, Ore., and in 1924 became associated with Joseph T. Ryerson & Son, Inc., in charge of reinforcing at the Ryer-



F. F. Trierweiler

ity of Michigan in 1915, and became associated with Thomas R. Kimball, architect, in Omaha, Neb. He served for two years as Captain of Engineers in the 42nd Rainbow Division in France during the World War. After a year with Kalman Steel Co. he entered the general contracting business at Portland, Ore., and in 1924 became associated with Joseph T. Ryerson & Son, Inc., in charge of reinforcing at the Ryer-



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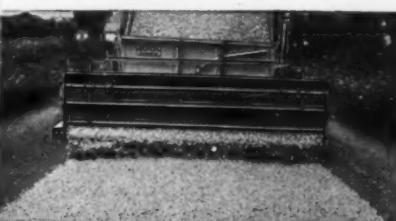
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Builders of equipment for Fifty Years

OSGOOD

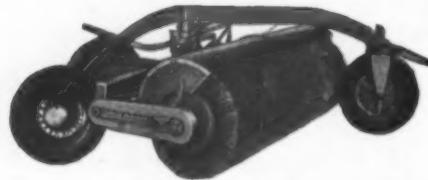


TYPE 90
for Heavy Duty Work.
Built to give long, satisfactory service under hard rock conditions.

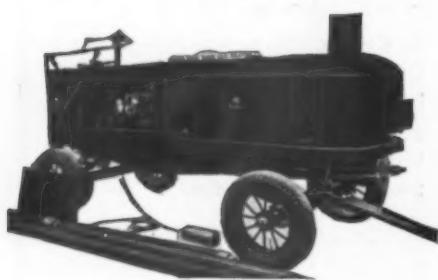
Write for details as
Shovel, Dragline or Crane

THE OSGOOD CO.
MARION OHIO

GRACE



2-WAY AXLE DRIVEN SWEeper RAPID FIRE HEATER



● Grace 2-Way Axle Driven Sweeper—the modern traction driven sweeper that successfully meets the sweeping problem of any contractor.

● Rapid Fire Heater—A fast-pumping, fast-heat circulating heater that heats 10,000-gallon insulated cars at 40-50° per hour. Write for information and prices.

W. E. GRACE MFG. CO. 6000 Holmes St.
DALLAS



Make an "ON-YOUR-JOB" Test
of a 1941 FORD TRUCK
or Commercial Car

With YOUR loads on YOUR routes
with YOUR driver. No Obligation.

STAR-LITE
REFLECTO PRODUCTS
New Luminous
REFLECTO CHAIN
FOR NATIONAL DEFENSE
Reflecto with lights, never without lights
Ideal for "Block-out" Signs
"FLEXIBLE AS A STRING"

SURFACE MARKERS
For STREETS and HIGHWAYS
"The Eyes of the Road"
Suggestions for your problems, no obligation.

THE STAR-LITE CO., 312 E. MARKET ST., INDIANAPOLIS, IND.

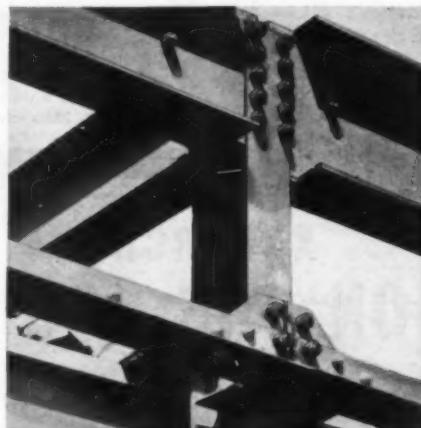
son Jersey City plant. Mr. Trierweiler has had broad training and many years of experience in the engineering and construction industries and is particularly well suited for his new position in charge of the Ryerson Reinforcing Division. With steel service plants in the ten principal industrial areas, the Ryerson Co. furnishes a complete line of concrete reinforcing bars, spirals, accessories, etc., cut, formed and tagged according to specifications.

Elastic Stop Nut Plant Enlarged

To meet the increased demand for its line of self-locking nuts, the Elastic Stop Nut Corporation has doubled the floor space of its plant at Union, N. J. The origi-



nal building was erected in 1940 by The Austin Co., and has attracted considerable attention by virtue of the fact that all of



Steel Construction, Showing Use of Bolts
and Elastic Stop Nuts, Instead of Rivets
Enlarged Plant

its steel construction is fastened with bolts and Elastic Stop Nuts, instead of rivets.

SNO GO
ELIMINATES dangerous one
way bottlenecks. Reduces ex-
pensive repeat plowing. Reduces
snow damage to roads, and cuts
resulting road repair. Plan now
for real snow removal next winter.

Klauder Manufacturing Co.
DUBUQUE, IOWA



MANGANAL

TRADE MARK REG. U. S. PATENT OFFICE

CAST WEDGE BARS



FOR REPOINTING MANGANESE
STEEL SHOVEL TEETH

STULLZ-SICKLES CO.
NEWARK, NEW JERSEY
SOLD ONLY THROUGH DISTRIBUTORS

For Low Cost Roads
Use Local Soil Materials
with CALCIUM CHLORIDE

Specifications and Data FREE. Write for literature explaining how local soil materials in proper proportion, treated with Calcium Chloride will provide dust free long wearing roads at surprising low costs and ease of maintenance. All technical bulletins free. Write today.

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Building, Detroit, Michigan

Reliance—
CRUSHING
SCREENING and
WASHING UNITS

• UP TO 2000 TONS A DAY •

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Kettles
Wash Boxes	Conveyors	Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd.
340 Canada Cement Co., Montreal, Que., Can.

MASTER WORKMAN



For Better Roads, put a WORKMAN
Machine on the job. 3 sizes:
**THE GENERAL • THE SUPER
THE MASTER**

YORK MODERN CORPORATION
UNADILLA, NEW YORK

Talk About DIGGING POWER!



• Powerful in biting and gripping, fast in action and ruggedly built, Williams Buckets are in a class by themselves for digging power and hard service.

Williams Buckets and Parts are carried by distributors in all parts of the country. Bulletins covering Williams Power Arm, Multiple Rope, and Dragline Buckets sent on request.

THE WELLMAN ENGINEERING CO.

7003 CENTRAL AVE., CLEVELAND, O.

WILLIAMS
Buckets
built by WELLMAN

Frank Study Appointed Regional Manager for Fruehauf

Roy A. Fruehauf, Vice-President and Director of Sales of the Fruehauf Trailer Co., announces the appointment of Frank Study as Regional Manager with headquarters at Atlanta, Ga. Mr. Study's territory will include Atlanta, Birmingham, Charleston, Charlotte, Jacksonville, Nashville, Norfolk, Richmond, Savannah and Wilson, Georgia. Mr. Study has a widespread reputation as an authority on highway transportation equipment and will bring to his new territory a thorough knowledge of haulage problems.

Oscar M. Lindahl Elected Vice-President Carnegie-Illinois Steel

Carnegie-Illinois Steel Corporation has announced the election of Oscar N. Lindahl as vice president in charge of finance, succeeding M. D. Howell, who will devote all of his time to duties as vice-president-financial, secretary and treasurer of United States Steel Corporation of Delaware. Mr. Lindahl has been associated with the Universal Atlas Cement Company since 1911, most recently as comptroller and secretary. Mr. Lindahl was born in Sweden, came to America and attended public and private schools at Chicago. He was employed by Butler Bros., in Chicago from 1900 to 1907. He entered the employ of United States Steel subsidiaries with the Illinois Steel Company in 1907, and joined Universal Atlas Cement Company in 1911. He served the cement company successively as general bookkeeper, chief accountant, auditor and assistant secretary, and comptroller and secretary. Mr. Lindahl is chairman of the Executive Committee and a former president of the Controllers Institute of America, a member and former director of the National Association of Cost Accountants, a member of the Advisory Committee and a former president of the Illinois Manufacturers Cost Association and former chairman of the Accounting Committee of the Portland Cement Association.

L. J. Fletcher Appointed Head of New Department of Caterpillar Tractor

Appointment of L. J. Fletcher as director of a newly created Training and Public Relations Department has been announced by Caterpillar Tractor Co. of Peoria, Ill. Mr. Fletcher, who entered the employ of the company Jan. 1, 1927, as Agricultural Sales Manager and advanced to the position of Assistant General Sales Manager, will direct further development of "Caterpillar" Factory Training Courses and Foremen's Conferences as well as engage in activities of a general public relations nature. Many and varied have been Mr. Fletcher's accomplishments. His years as a member of the faculty at Washington State College and the University of California



L. J. Fletcher

"Caterpillar" Factory Training Courses and Foremen's Conferences as well as engage in activities of a general public relations nature. Many and varied have been Mr. Fletcher's accomplishments. His years as a member of the faculty at Washington State College and the University of California



A Knockout Blow!

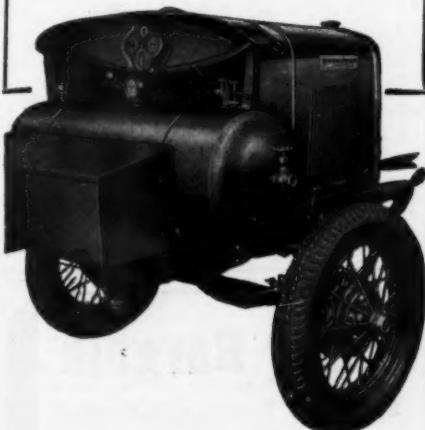
to large, cumbersome compressors on many of your jobs

SMITH AIR COMPRESSORS

are lightweight, sturdy and exceptionally low-priced

Think of the Smith's many advantages on your jobs and, you'll agree it deals a knock-out blow to expensive, heavy compressors in numerous instances.

Move it easily from one job to another. Tow it at permissible truck speeds. Made with FORD MOTORS and standard parts, its ruggedness and efficiency are sources of constant satisfaction to users everywhere. Repairs and parts available at any Ford garage. Priced far below standard compressors of equal capacity. 60 cu. ft. size uses only one gallon of gasoline an hour. Head equipped with high speed compressor valves; automatic unloading and idling. All the power you'll need for a majority of compressor work. Why not take advantage of this important way to save?



With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

Write for free booklet

GORDON SMITH & CO.
475 College St. Bowling Green, Ky.

CLEARING HOUSE

CLEARING HOUSE SECTION

(Not available for general advertising)

RATES

Undisplayed Classified Rate: 10 cents per word per insertion; minimum charge \$2.00, payable in advance.

Position Wanted: 5 cents per word per insertion, payable in advance.

Count 11 additional words for box number. Estimate 35 characters to the line.

Display Classified Advertising Rate: 26.50 per column unit "inch" per insertion, payable with order, the unit "inch" measuring $\frac{1}{2}$ inch on column depth.

Contract rates in display classified advertising in this section sent on request.

Copy subject to publisher's acceptance.

NEW AND USED EQUIPMENT

IMMEDIATE DELIVERY

All used items have been re-conditioned and are guaranteed.

	Condition
1—9" x 16" bronze bearing DIAMOND Jaw crusher complete with flywheels and Model P2877D LeRoi motor mounted on trailer unit with steel wheels. (Power: 16-28 HP. 4 Cylinder @ 900-1500 RPM).....	New
2—Pitman assemblies with SKF bearings including main bearings for 10" x 20" jaw crusher.....	New
1—Bucket elevator 32'0" centers, rigid type, with buckets 12" x 6" x 7 $\frac{1}{2}$ " mounted on belt	New
3—Pitman assemblies for 10" x 20" jaw crusher, bearings SKF type.....	Slightly Used
3—10" x 36" Pitman assemblies for 10" x 36" jaw crusher	Used
1—15" x 36" Pitman assembly complete.....	Rebuilt
1—20'0" bucket elevator with buckets 16" x 6" x 7 $\frac{1}{2}$ " mounted on chain.....	Rebuilt
1—30'0" x 10'0" double shaker screen. Slightly Used	
1—Grizzly and hopper 6'8" x 6'8" with 5" sq. opps. and 20" x 30" plate feeder. Good Cond.	
2—Quarry Plants with 10" x 20" anti-friction brass jaw crushers and folding type bucket elevators size 12" x 6" x 7 $\frac{1}{2}$ " x 25'0" mounted on trucks with four steel wheels	New
2—30 cubic yard bins, 3 compartment with jack lug.....	New
6—Steel wheels 40" dia. x 16" face to take 4" Hyatt bearings.....	New
4—Steel wheels 40" dia. x 16" face to take 4" Hyatt bearings.....	New
4—Steel wheels 28" dia. x 4" face bore 1 $\frac{1}{2}$ ".....	New
10—Steel wheels 28" dia. x 5" face, bore 1 $\frac{1}{2}$ ".....	New
8—Steel wheels 24" dia. x 3 $\frac{1}{2}$ " face, bore 1 $\frac{1}{2}$ ".....	New
4—Steel wheels 28" dia. x 14" face, bore 4" Hyatt.....	New

POWER UNITS

1—U-40 Allis-Chalmers Gasoline Power Unit @ 36 Cont. HP. @ 1200 RPM.....	Rebuilt
1—W-25 Allis-Chalmers Gasoline Power Unit @ 25 HP. @ 1300 RPM.....	Rebuilt
1—Model 300 International Power Unit. Max. HP. 56 @ 1050 RPM.....	Used

The above pitman assemblies can be installed in new bases and sold as complete machines.

DIAMOND IRON WORKS, INC. AND MAHR MANUFACTURING CO. DIV. MINNEAPOLIS MINNESOTA

Paver Bargain

27E Foote Paver — Continental Motor. No Water System. Location Cleveland.

Phone—Write—Wire

J. T. CONNERS

718 Wagar Road Rocky River, Ohio

gave him wide experience in training methods in the field of engineering; he is acquainted with the work of industrial organizations and has long been active in the field of public relations. He served as president of the American Society of Agricultural Engineers and has taken part in the work of many other national and local technical and business organizations. Prior to joining the company, Mr. Fletcher's experience dealt mainly with operation and utilization of tractors and tractor operated equipment. His duties with the company have been associated with sales development and training and maintenance of close contact with users of "Caterpillar" products to the end that customers' desires would be incorporated effectively into equipment better adapted for the jobs on which "Caterpillar" machines are employed.

Industrial Tractor & Equipment Co., Inc., Appointed Bucyrus-Erie Distributors

Industrial Tractor & Equipment Co., Inc. of Baton Rouge, La., have been appointed distributors for Bucyrus-Erie $\frac{3}{8}$ yd. to $2\frac{1}{2}$ yd. shovels, draglines, clamshell and lifting cranes. Their territory covers the state of Louisiana except for the parishes around New Orleans and the Delta.

Ransome Appoints New Representative in Texas

The Ransome Concrete Machinery Co., Dunellen, N. J., has appointed The San Antonio Machine and Supply Co., San Antonio, Tex., to handle their complete line of contractors' equipment in certain sections of that state.

NEW TRADE LITERATURE

Conveyor Belt.—A catalog section on its new turntable belt has just been issued by The B. F. Goodrich Co., Akron, O., and is now available upon request. The catalog section describes the belt's functions and reasons for its patented design, gives details on construction, and proper method of turning the belt.

Vibration Paving of Concrete Highways.—Blaw-Knox Company, Pittsburgh, Pa., has issued a bulletin on vibration paving of concrete highways. Highlight of this bulletin, No. 1825, is a comparative description of core tests taken from vibrated and non-vibrated sections of a recently paved Indiana State Highway Project. The core tests show that it is possible to improve uniformity and compressive strength through the use of the modern Blaw-Knox spreader vibrator. Compressive strength tests reveal that the vibrated pavement had an average strength of 6,860 lb. per square inch, whereas the non-vibrated pavement had an average strength of 5,403 lb. per square inch. Moreover, the variation in the vibrated slab was only 1,760 lb., whereas the non-vibrated pavement had a variation of 3,300 lb. from its strongest to its weakest sections. The bulletin will be furnished upon request.

Dump Bodies and Hoist.—Gar Wood Industries, Inc., Hoist and Body Division, Detroit, Mich., has issued the following

CLEARING HOUSE

FOR SALE

SHOVEL, Model 4 Northwest 1 yard.
SHOVEL, $\frac{1}{2}$ yd. Inslay, in operating condition.
CRANE, Model 4 Northwest 1 yard.

WAGON DRILLS (14), Cleveland DR-8 (latest model) Universal Drill Rigs, with recoil device, for depth of 25 to 30 ft. change, mounted on three rubber tires; with D-14 Dr Cleveland drifter; recommended for use with 260 ft. or 315 ft. compressor. In excellent condition.

DRILL SHARPENER, Sullivan Class C.

SCALE, Winslow 12 ton truck scale.

CLAMSHELL BUCKETS, $\frac{1}{2}$ to $\frac{1}{4}$ yard.

PAVER, 13E ($\frac{1}{2}$ yd.) Koehring on full crawlers, 20 ft. boom and bucket, good condition.

ROLLER, 10 ton Buffalo-Springfield 3 wheel, two cylinder gas, with scarifier, good condition.

SCRAPER, 5 yd. Austin-Western cable scraper, with winch and power take-off.

CRUSHING PLANT, Cedar Rapids, 9 x 38 one-piece outfit with 936 plain bearing crusher, trap, feeder, feed conveyor, delivery conveyor, revolving screens, mounted on trucks with steel wheels in front, solid rubber tires rear.

PILE HAMMERS, No. 3 Vulcan and No. 7 Mc-Kiernan-Terry.

CRANE BOOM, 40 ft. lattice type, in good condition. For Model 2 and 3 Northwest machines.

Write for our complete list

O. B. AVERY COMPANY
1325 Macklind Avenue St. Louis, Missouri

FOR SALE

Loco. Cranes—15-20-25 ton; 7 $\frac{1}{2}$ to 12 ton gas.
Shovel-Crane-Drag—Trench Hoes; NW—Lorain
—P&H—Marion—Link-Belt, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, 1 $\frac{1}{2}$, 2, $2\frac{1}{2}$ yd.

Shovel & Hoe Attachments, $\frac{1}{2}$ yd. & larger.

Cruckrane—6 wheel pneumatic, full revolving.

Fairlead for L-B K-45. P&H $\frac{1}{2}$ yd. shovel front.

Hoists & Derricks—Misc. sizes and types.

Buckets—Draggs, $\frac{3}{4}$ -8 yd.; **Clams**, $\frac{3}{4}$ -4 yd.

Overhead Trav. Cranes—5 to 25 tons, AC-DC.

JAS. WOOD, 53 West Jackson, Chicago, Illinois

FOR SALE OR RENT

HEAVY GRADING EQUIPMENT

1—Model KO 54 AC speed patrol grader.

1—Model 10-K Ryan pull grader.

1—No. 14 AC power controlled pull grader.

1—10-ton Huber roller, gas engine power.

1—10-ton Buffalo steam roller.

1—4 to 5 yard Ateco hydraulic scraper.

1—Model L tractor.

1—Model LO Allis-Chalmers tractor.

1—Model K Allis-Chalmers tractor with dozer.

USED TRACTOR PARTS

Large assortment parts for Models L and LO Allis-Chalmers and 60 and 65 Caterpillar, including transmissions, gears, sprockets and motors.

Write for our complete used equipment list

GENERAL MACHINERY COMPANY
SPOKANE, WASHINGTON

FOR SALE:

30 x 10 Portable CRUSHING PLANT

4 x 8 Telsmith Vibrating SCREEN

1 Ton Cap. ASPHALT PLANT

3—800 x 1,000 Gal. DISTRIBUTORS

18 in. x 200 ft. BELT CONVEYOR

5—RD-6, 7, 8 DIESEL TRACTORS

$\frac{1}{2}$ yd. Owen CLAMSHELL

10 Ton Tandem ROLLER

2—1,000 ft. DIESEL AIR COMPRESSORS

30—1 $\frac{1}{2}$ yd. and 3 yd. DUMP CARS

6 ORANGE PEELS—6 to 27 ft.

100 H.P. Lambert three drum ELEC. HOIST

5 Parsons & Cleveland TRENCHERS

Tidewater Equipment & Machy. Corp.
305 Madison Ave. New York, N. Y.

ROADS AND STREETS
is The Engineering Contracting Authority of the Highway Industry.

CLEARING HOUSE**FOR SALE****ROLLERS**

2—Fordson 3 wheel—4 ton—Gas
2—10 Ton 3 wheel—Gas
1—5 ton 3 wheel—Gas
2—Gallon Portable Rollers—5 ton
5 Tandem Steam Rollers—5-6-7 Ton

GRADERS

2—No. 5 Huber—12' Motor Graders—Gas—1940
Model
2—Austin 10' Motor Grader—Solid Rubber Tires
1—Gallon 10' Motor Grader—Pneumatic Tired

PUMPS

9—Carter Hundinger 3" Single Diaphragm Pumps
6—Centrifugal Pumps—2", 3", 4"

AIR COMPRESSORS

10—LeRoi & Schramm 105' Two Stage

4—LeRoi 210' Two Stage

6—LeRoi 315' Two Stage

1—Schramm 210' Two Stage

1—Schramm 315' Two Stage

1—Schramm 105' Fordin**MISCELLANEOUS**

9—Cleveland Sheeting Drivers
21—Cleveland C7 & C9 Breakers
15—Cleveland H. 10 & H. 11 Rock Drills
1—Cleveland WDA10 Wagon Drills
1—Cleveland DRS Wagon Drill
2—Cletrac Diesel Bulldozers—Model BD
1—Austin 8 yard Scraper
3—Lincoln 300 Amp Portable Welders, Gas Engine
Driven
2—Hobart 300 Amp Portable Welders, Gas Engine
Driven
1—1/2 yd. Kiesler Clam Shell Bucket with teeth.

CHICAGO CONSTRUCTION EQUIPMENT CO.
8039-41 South Halsted Street
Chicago, Illinois RAD. 5800

FOR SALE

One Complete Crushing Plant consisting of:
One 1520 Austin-Western Roller Bearing Jaw Crusher
One 30 x 18 Austin-Western Roller Bearing Roll Crusher
1—40-ft. Bucket Elevator
1—4 x 8 Double Deck Gyrating Screen
1—21-ft. x 18-in. Belt Conveyor
1—IHC-PD80 Diesel Engine

All equipment new 1939. In service four months. Located Pittsburgh, Penna.

JOHN W. PATTERSON CO.
324 Fourth Ave., Pittsburgh, Pa.

Hall-Perry Machinery Co.

812 E. Iron St.
BUTTE, MONTANA

EQUIPMENT AND SUPPLIES FOR:
Contractors
Mines
Mills
Municipalities

We will be glad to figure on equipment and supplies for any job.

EQUIPMENT FOR SALE

One Bucyrus-Erie, Model 43-B, Diesel Powered; Shovel in First Class Operating Condition; Seven Model 87Q Hug Trucks with 7 Cubic Yard; Heavy Duty Dump Bodies. These trucks in Number 1 Condition.

SPENCER CONSTRUCTION CO.
Carrollton, Texas

CHARLES EVAN FOWLER

M. INST. A.C.E. M. ENG. INST. CAN.
LONG SPAN BRIDGES—FOUNDATIONS
RIVERS—HARBORS—PORT WORKS
"IDEALS OF ENGR. ARCHITECTURE"
1120—8 Av. S., Seattle 92 Liberty St. N.Y.C.

bulletins: Bulletin No. 7 illustrates and describes Gar Wood Hoists and Dump Bodies for 1½-2 ton trucks. Bulletin No. 16 illustrates and describes Gar Wood Hoists and Dump Bodies for Ford Trucks. Bulletin No. 17 illustrates and describes Gar Wood Hoists and Dump Bodies for Chevrolet trucks.

Road Building Equipment—The use of modern roadbuilding and construction machinery in the development and progress of states, counties, cities and towns, is described in a 20-page booklet that has just been issued by Caterpillar Tractor Co. Motor graders, tractors and Diesel engines are illustrated on a wide variety of jobs from snow removal to municipal generating plants. The ability of a single modern construction machine to economically perform a quantity of tasks is also illustrated. Copies of the booklet may be obtained by writing Caterpillar Tractor Co., Peoria, Ill., and requesting Form 6531.

Concrete Mixers—The new Rex Building Mixer Catalog for 1941 has been issued by the Chain Belt Co., Milwaukee, Wis. In this book the complete line of Rex Concrete Mixers from the 3½-S up to and including the 14-S are described and illustrated together with complete information on their individual features. Accessories are also shown. One of the interesting features of the catalog is the "tab" indexing which sectionalizes the book by machines and features. Each subject and each machine is in its proper place and can be easily found. Copy for the book has been purposely limited in length to afford more room for bigger and more descriptive pictures which, of course, run a close second to actual demonstration. In the rear of the book, presented in a very clear and convenient manner, are very complete specifications on each machine in the line.

Airport Runway Construction—A circular giving design data on concrete runways and aprons has been issued by Laclede Steel Co., Arcade Bldg., St. Louis, Mo. Included in it are details of pavement design and joint construction.

New Hydraulically Controlled Shovel—In a bulletin just released by the Harnischfeger Corporation of Milwaukee, Wis., the P&H Model 855 shovel with its new hydraulic control system is described in interesting detail. The simple, low pressure hydraulic control system used on the P&H 855 is based on the same principle used so successfully in the automotive industry for the past 15 years. Important details about the P&H Model 855 shovel may be found in the illustrated Bulletin X-20-1, which may be had by writing the Harnischfeger Corporation, Milwaukee, Wis.

Hoists, Trolleys, Cranes—A revised edition of their general hand-operated hoisting equipment, trolleys, and cranes has been announced by the Wright Manufacturing Division of the American Chain and Cable Company, Inc., York, Pennsylvania. Additions to the line include a floor type gantry crane, a portable floor crane, and a new winch. Complete data is included on spur-gear, screw-gear and differential hoist as well as considerable engineering data on cranes, trolleys, and winches.

CLEARING HOUSE**TRANSITS and LEVELS**

**New or Rebuilt
Sale or Rent**

**Headquarters for
REPAIRS**—any make.
Factory Service. We will
also *buy your old instruments* or take them in trade.

**A complete line of Engineering
Instruments and Equipment for Field
or Office. Write for Bulletin RS 66.**

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
136 N. 12th St. Philadelphia, Penna.

EQUIPMENT FOR SALE

FOR SALE—Euclid Tractor Trailer (bottom dump) hauling units in good operating condition; Hercules gasoline engines, 1800x24 driving tires; 9-yd. capacity. **Roy C. Whayne Supply Co., 8th and Main St., Louisville, Ky.**

POSITIONS WANTED

POSITION WANTED—As superintendent or foreman on bridge construction, ten years as superintendent for one firm and two years previously as foreman. Have very wide experience on all types of piling, steel erection, form building, and cofferdams. Age 32, married and strictly sober. **Box 428, Roads and Streets, 330 S. Wells St., Chicago.**

POSITION WANTED—Experienced equipment salesman with sound experience in tractor and allied equipment, snow removal, earth moving and general contractors' machinery. At present employed and desirous of representing manufacturer to dealer organization in Eastern territory. **Box 426, Roads and Streets, 330 S. Wells St., Chicago.**

POSITION WANTED—As superintendent with contractor. Over 20 years' experience in all types road construction both city and highway, also culverts, drainage, sewers, reinforced concrete. Good references. **Box 427, Roads and Streets, 330 S. Wells St., Chicago.**

POSITION WANTED as Superintendent—Have 30 yrs. experience building all phases of Federal, State and City paving, bridges, viaducts, heavy and light grading, interceptor sewers, water lines, foundations and flood walls. Familiar with all modern equipment. Qualifications cover any project. Organizer and knows cost. Age 46 yrs. Best references. **Box 421, Roads and Streets, 330 S. Wells St., Chicago.**

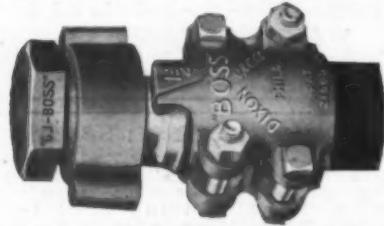
POSITION WANTED—Civil engr., 34, married, employed. Desires to make change to private employment. Experience: 1 yr. Hydrographic Survey, 1 yr. heavy tunnel construction, 2 yrs. grading and paving, 4 yrs. bridge constructions, 4 yrs. structure maintenance and condition inspection and report. Past 10 yrs. with one employer. Desires position in heavy construction, industrial plant maintenance, or what have you? Will go anywhere—deferred draft class because of family. **Box 423, Roads and Streets, 330 S. Wells St., Chicago.**

POSITION WANTED—Am 25 years of age, married. Have had six years of construction experience. Can do welding and repair work. Ambitious and would like to travel. **Box 424, Roads and Streets, 330 S. Wells St., Chicago.**

POSITION WANTED—Operator, white, age 30, married, have five years' experience as shovel (gas) and bulldozer (gas) operator on road construction and landscaping. Am capable of doing minor repairing. Best references. **Box 425, Roads and Streets, 330 S. Wells St., Chicago.**

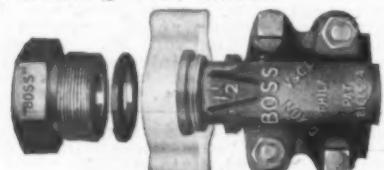
Try Them..
**ON STEAM, AIR
 AND LIQUID LINES**

*and Learn Why They
 Outsell All Others!*



"GJ-BOSS"
GROUND JOINT STYLE X-34
HOSE COUPLING

Every day, in every kind of service, "GJ-BOSS" couplings are giving increasing proof of their unequalled quality and reliability. In addition, their ground joint feature eliminates all risk of shut-downs to replace worn or mislaid washers. Copper insert in spud fits rounded head of stem, forming soft-to-hard metal seal that remains leakproof regardless of wear or the presence of abrasive particles. Furnished with strong malleable iron 4-Bolt "BOSS" Offset Interlocking Clamp on sizes 1" and larger; 2-Bolt "BOSS" Interlocking Clamp on sizes $\frac{1}{2}$ " and smaller. Cadmium plated—rust-proof. Sizes $\frac{1}{2}$ " to 4", inclusive.



"BOSS"
WASHER TYPE STYLE W-16
HOSE COUPLING

Same as "GJ-BOSS" Ground Joint Coupling described above, except that coupling end of spud and head of stem are flat flanges to accommodate washer. Cadmium plated—rust-proof. Sizes $\frac{1}{2}$ " to 4", inclusive, with same clamps as "GJ-BOSS".

NOTE: For companion Male Coupling for both the "GJ-BOSS" and "BOSS" Female Couplings, specify "BOSS" Male Coupling Style MX-16.

*Stocked by Leading Rubber
 Manufacturers and Jobbers*

DIXON
VALVE & COUPLING CO.

Main Office and Factory: Philadelphia

Branches:

Chicago • Birmingham • Los Angeles • Houston

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